Notice.

The letter press of the Flora Sylvatica as now issued is only initiatory, and it is hoped that Forest Officers throughout India will furnish the author with all information procurable about the different trees of their districts.

The following are the main heads under which the history of each tree might be treated.

1. Geographical distribution, influence of soil, aspect, elevation, associates (other trees and bamboos, &c.) Its worth as an avenue tree, or as a tree for ornament or shade.
2. Mode of growth, size, age.
3. Rate of growth.
4. Bark.
5. Time of flowering, ripening and shedding of seed.
6. Germination.
7. Reproduction from seed.
8. " " shoots.
9. Diseases, insects and other enemies, death.
10. The wood and full particulars of its character and uses.
11. All the uses of the tree and its different parts.
12. Vernacular names in different provinces.

The plates and descriptions will make the identification of each tree an easy matter and will supply a want long felt by many in the Forest Department. The letter press only will be reprinted when the plates are finished and further information has been elicited.

Dried flowering and fruiting specimens of rare or little known forest trees will be thankfully received by the author.

POLYALTHIA CERASOIDES. (Nat. ord. Anonaceæ.)

POLYALTHIA. (Bl.) *Gen. Pl. page* 25.—GEN. CHAR. Sepals 3, free or connate below, valvate or slightly imbricate in æstivation; petals 6 equal or sub-equal, valvate in 2 series in æstivation, ovate or linear; stamens numerous linear or cuneate, connective dilated, and thickened beyond the cells, carpels numerous. Stigma oblong or capitate, ovules one or two usually erect; fruit-carpels stipitate or oblong 1 seeded—trees or shrubs.

POLYALTHIA CERASOIDES. (Dun.) Leaves oblong or lanceolate acute, pubescent beneath: flower bearing shoots almost abortive lateral leafless; peduncles solitary, terminal, with one or two bracteas at their base; calycine lobes nearly as long as the corol: petals equal oval oblong thick; carpels globose dark red, size of a cherry, on stalks nearly twice their length.—*D. C. prod.* i. *p.* 93. Guatteria cerasoides.—*W. A. prod. p.* 10. Uvaria cerasoides.—*Roxb. Fl. Ind.* ii. *p.* 666.

A straight handsome tree of moderate size, timber whitish and close-grained and of considerable value, much used in the Central Provinces and in the Bombay Presidency—it is used in carpentry and for naval purposes, such as boat masts and small spars, but apparently little known in Madras. It is common in dry forests near the foot of all the mountains on the western side of the Madras Presidency, in the Salem forests, the Nullay Mullays, Mysore, Orissa and the Godavery forests—it flowers in the hot months, and the flowers are fragrant and of a greenish color. It has never yet been cultivated or planted. In the Godavery forests it is known by the names of Dudugu and Chika Dudugu, (Teligoo) and in the Bombay Presidency it is called Hoom, (Mah.)

BENGAL SECRETARIAT LIBRARY.

Polyalthia cerasoides. (Dun.)

GOVINDOO DEL.

DUMPHY LITH.

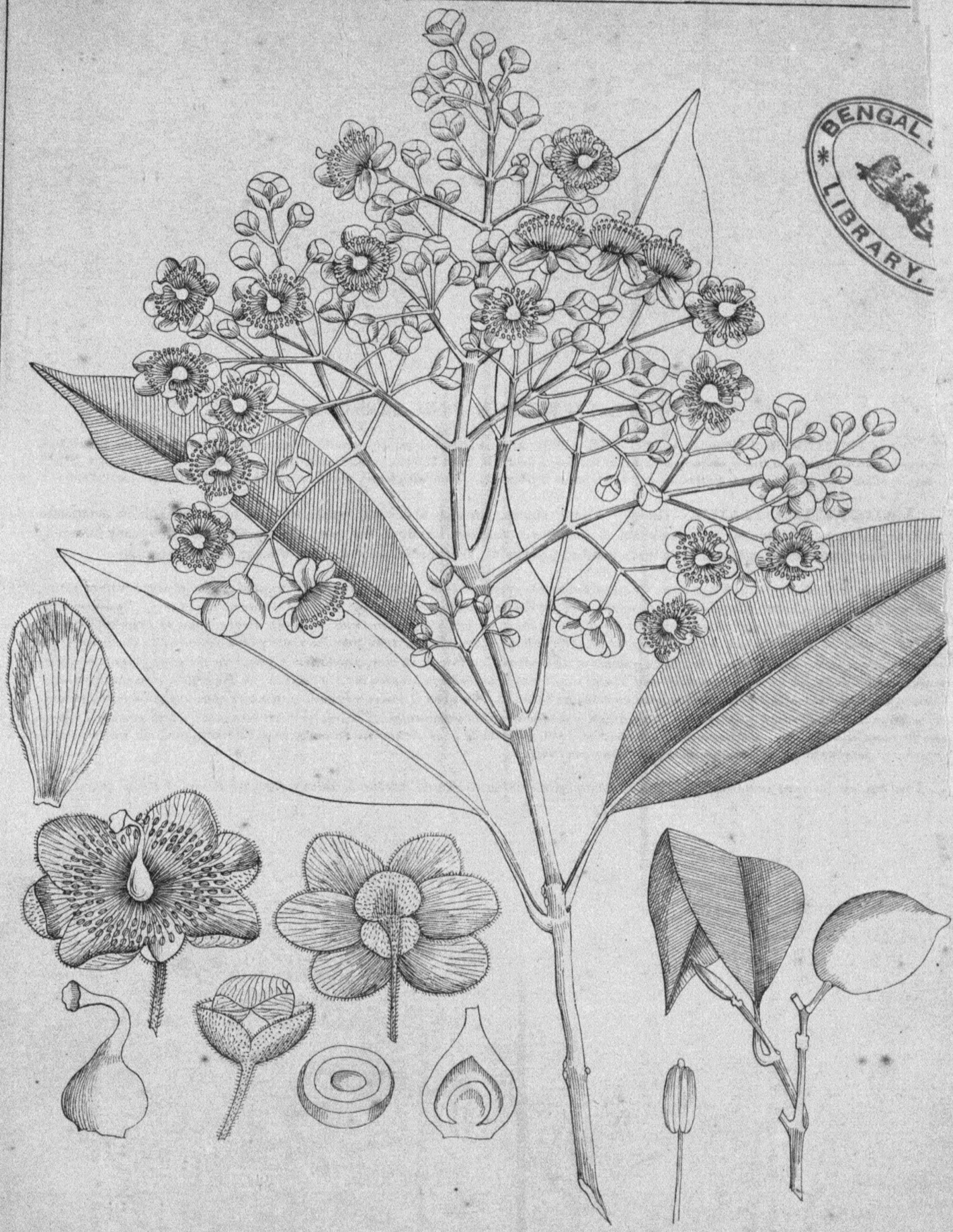
CALOPHYLLUM ELATUM. (Nat. ord. Guttiferæ.)

CALOPHYLLUM. (Linn.) *Gen. Pl. p.* 175.—GEN. CHAR. Flowers often polygamous, perianth composed of 4-12, sepals and petals imbricated in 2-3 series, stamens numerous free or scarcely connate at the base; filaments short filiform, anthers erect ovate or oblong 2 celled dehiscing longitudinally; ovary 1 celled, style longish stigma peltate, ovule 1 erect, drupe indehiscent. Trees with leaves furnished with numerous transverse parallel nerves.

CALOPHYLLUM ELATUM. (Bedd.) Young shoots, panicles and outer sepals ferruginous, leaves ellip ic acuminate attenuated at the base, very shining, petioles about 1 inch long, panicles terminal and from the upper axils large many flowered; sepals 4, two outer ones sub-rotund small, two inner petaloid; petals 4; fruit *ovoid* pointed about the size of a thrush's egg.

A very large straight tree with numerous longitudinal cracks down the bark, grows abundantly in most of the moist ghat forests or sholas, in our Western coast from Canara down to Cape Comorin, and in similar forests on the lower Pulneys, Anamalloys, Coorg, Mysore and the Sirumallays—it is never found in dry deciduous forests—it yields the poonspar of commerce and is known by the name of Poon or Poone in Malabar, Siri Poone in South Canara, and Pongoo in the Anamallays—thousands of these trees have lately been destroyed by the axe of Coffee planters in Malabar, Coorg and Travancore; large quantities still remain but chiefly in very inaccessible places. In the ghat forests of South Canara they are felled by the Forest Department and floated down rivers to the coast depôts, but the demand for the article does not seem great, though many years ago a single fine spar has fetched as much as 1,000 *Rs. The wood is scarcely known, except as a spar, though it is occasionally used for building and bridge-work by planters—it is reddish, coarse grained but ornamental. The tree has never been planted and would not succeed except in the moist forests on the mountains at an elevation of* 1,000 *to* 4,000 *feet; it flowers in January and February, and the seed falls early in the rains and germinates freely in the dense shade of the shola forests.*

This tree was for some years supposed to be the Calophyllum angustifolium of Roxburgh, which is from the Prince of Wales' Island.



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GOVINDOO, DEL:

DUMPHY, LITH:

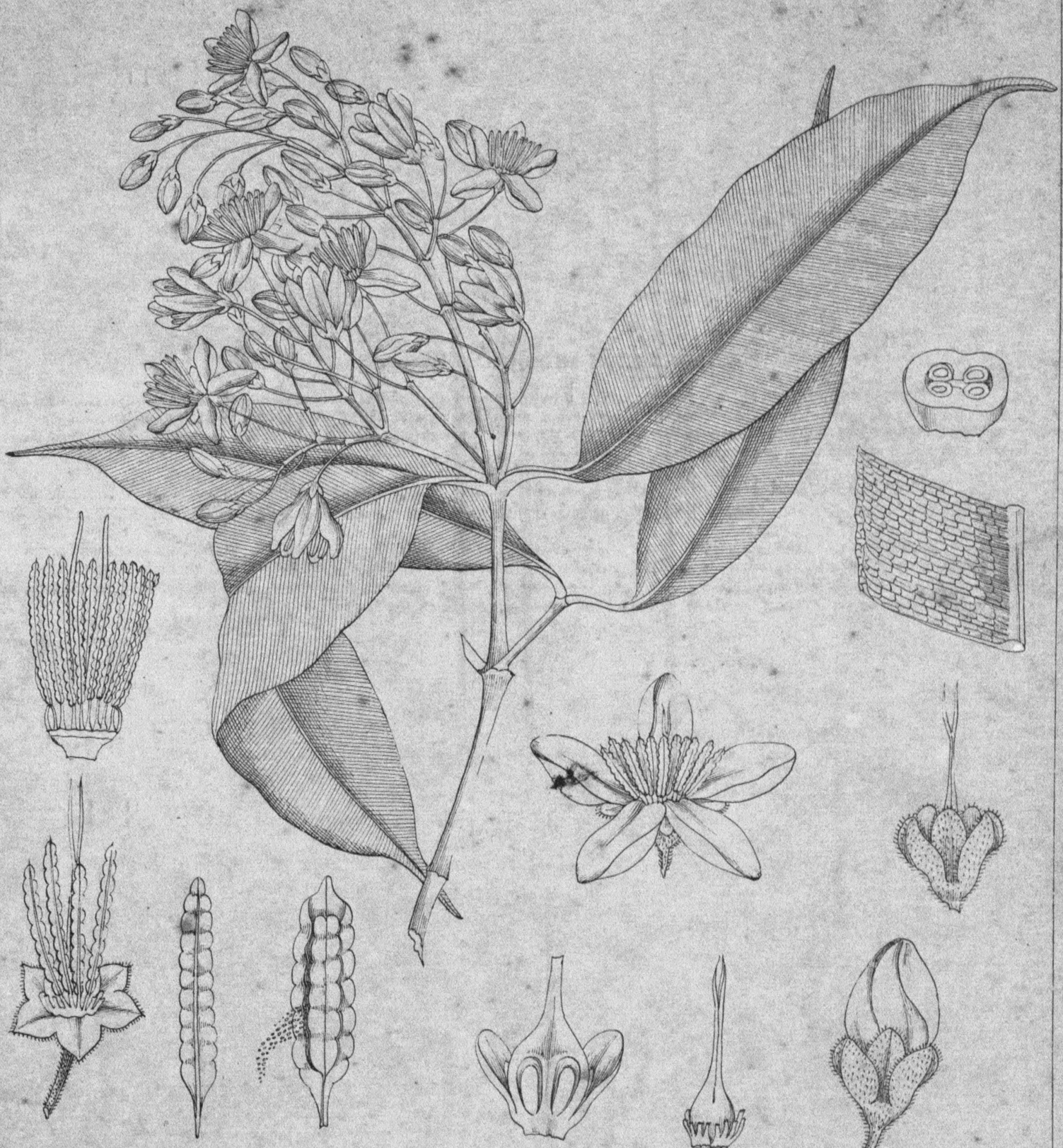
Calophyllum elatum. (Beddome.)

PŒCILONEURON INDICUM. (Nat. ord. Ternstræmiaceæ.)

PŒCILONEURON. (Bedd.) *Gen. Pl. p.* 981.—GEN. CHAR. Sepals 5 equal imbricate, petals 5 contorted, stamens numerous (about 20) on a tube surrounding the ovary which is either inconspicuous and entire or more or less prominent and 5 cleft, so that the stamens are sub-pentadelphous: anthers linear erect affixed by their base, ovary 2 celled, styles 2 subulate, ovules 2 in each cell, erect. Fruit? trees with opposite coriaceous shining leaves with close parallel venation and minutely reticulated.

PŒCILONEURON INDICUM. (Bedd.) Leaves ovate-oblong with a long acumination glabrous, panicles terminal, many flowered, flowers yellowish white, calyx peduncles and pedicles slightly puberulous. *Bedd. in Journl. Linn. Soc. VIII.* 267 *to* 17.

A good sized tree, common in the ghat forests of South Canara and Malabar up to an elevation of 4,000 *feet—it is never found except in the shola forests; in South Canara it is well known to the natives under the name of Kirbally (Can.), but though I have seen the tree on the Siparah ghat and elsewhere in Malabar, it seems unknown to the natives. The timber appears to be of considerable value, but is almost unknown at present—it is very hard and is used for Rice-pounders in South Canara—it flowers in March and April.*



Poeiloneuron Indicum (Bedd.)

GOVINDOO, DEL.

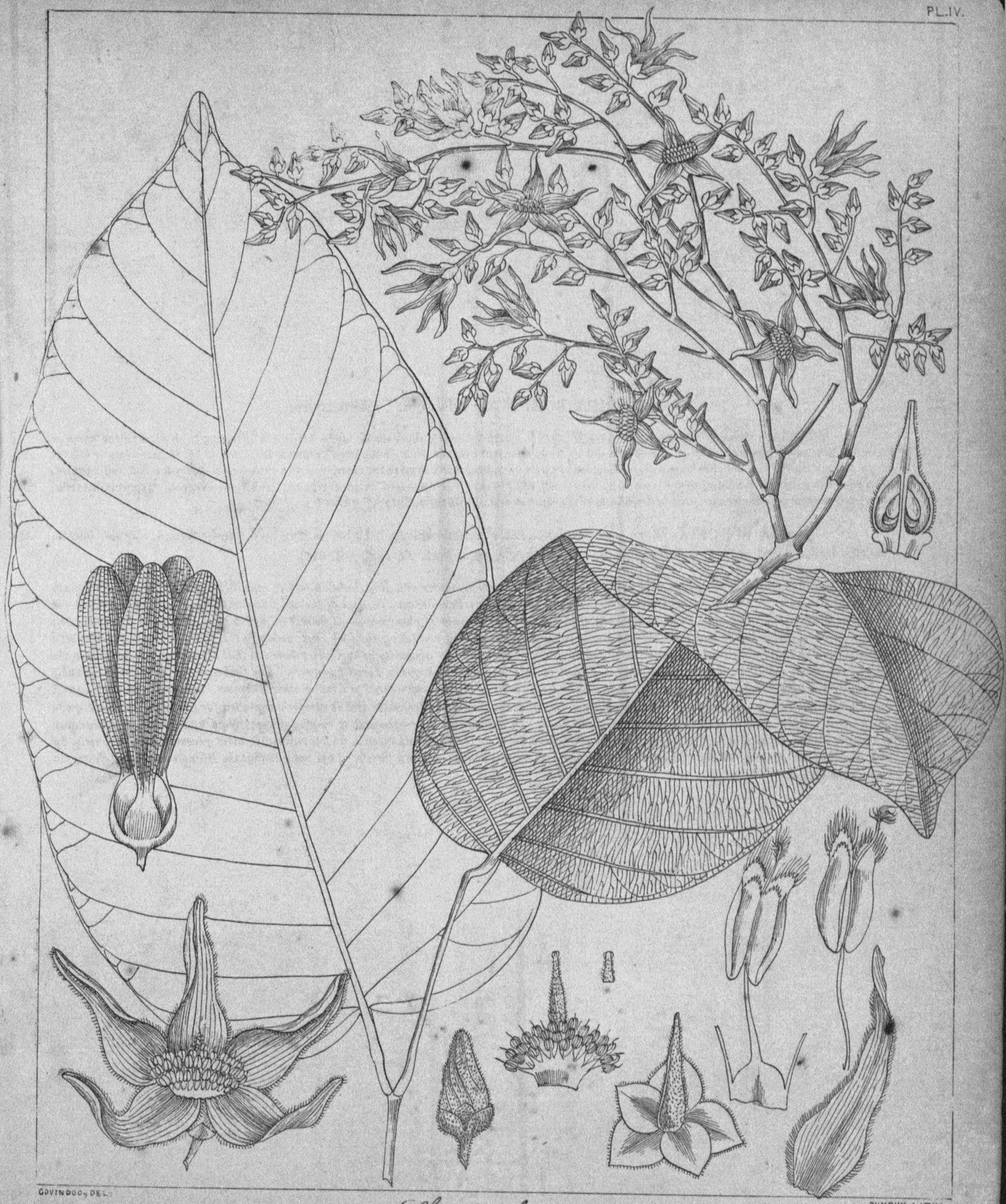
J. DUMPHY LITH.

SHOREA ROBUSTA. (Nat. ord. Dipterocarpeæ.)

SHOREA. (Roxb.) *Gen. Pl. p.* 193.—GEN. CHAR. Calyx tube very short adnate to the torus, not increasing in fruit, divisions ovate or lanceolate imbricate wing-like and all or 3 only enlarged in fruit, connivent over the fruit at the base. Stamens numerous or 15, anthers ovate or oblong, rarely linear, connectivum subulato-cuspidate, cells obtuse or rarely cuspidate, valves equal or the exterior valve a little larger—ovary 3 celled, cell 2 ovuled, style subulate, entire or 3 toothed at the apex, fruit coriaceous indehiscent; 1 seeded—seed ovoid, cotyledons thick fleshy unequal. Trees bearing resin, glabrous or tomentose stipules persistent or deciduous, leaves entire or repand panicles axillary or terminal.

SHOREA ROBUSTA. (Roxb.) Leaves short petioled cordato-oblong, 6-10 inches long by 4-6 inches broad, stipules falcate, panicles terminal and axillary, stamens numerous, stigma 3 toothed. *Roxb. Fl. Ind. p.* ii. 615.

An immense timber tree, abundant in the Godavery forests, the Gumsoor and Russelcondah forests, and in Bengal (the Terai, Parasnath and Assam) and in Burmah ? but not known in the South of the Madras Presidency. In some of the Sal tracts in Gumsoor it grows almost to the exclusion of every other tree and the natural forests often have the appearance of plantations—it flowers in March and April, and the seeds often commence germinatiny before they leave the parent tree early in the rains and eventually come up very thickly in the forests. The tree grows very straight and tall and sometimes reaches 10 *or* 12 *feet in girth. The seed has a vitality of such short duration that all attempts to grow it in the South have failed, though it was attempted several successive seasons—it is also rapidly bored by insects. The timber is one of the most valuable in India for Engineering purposes and is largely used in Gun Carriage Manufactories and for many other purposes, such as house-building and ship-building, but warps in plank—it lasts an immense time under ground or under water and is almost unequalled for sleepers, and seems quite proof against white ants ; it is close grained, heavy and hard, of a light brown color—the bark is employed by tanners and yields an abundance of resin or dammer which is used as a substitute for pitch, and burnt by the natives as incense, and an aromatic oil is procured from the resin by dry distillation. It is called Sal and Salwa in Gumsoor and Googul in the Godavery forests. I am not sure that the Birmese tree called Eingg-yiu is the same species.*



GOVINDOO, DEL.

DUMPHY, LITH.

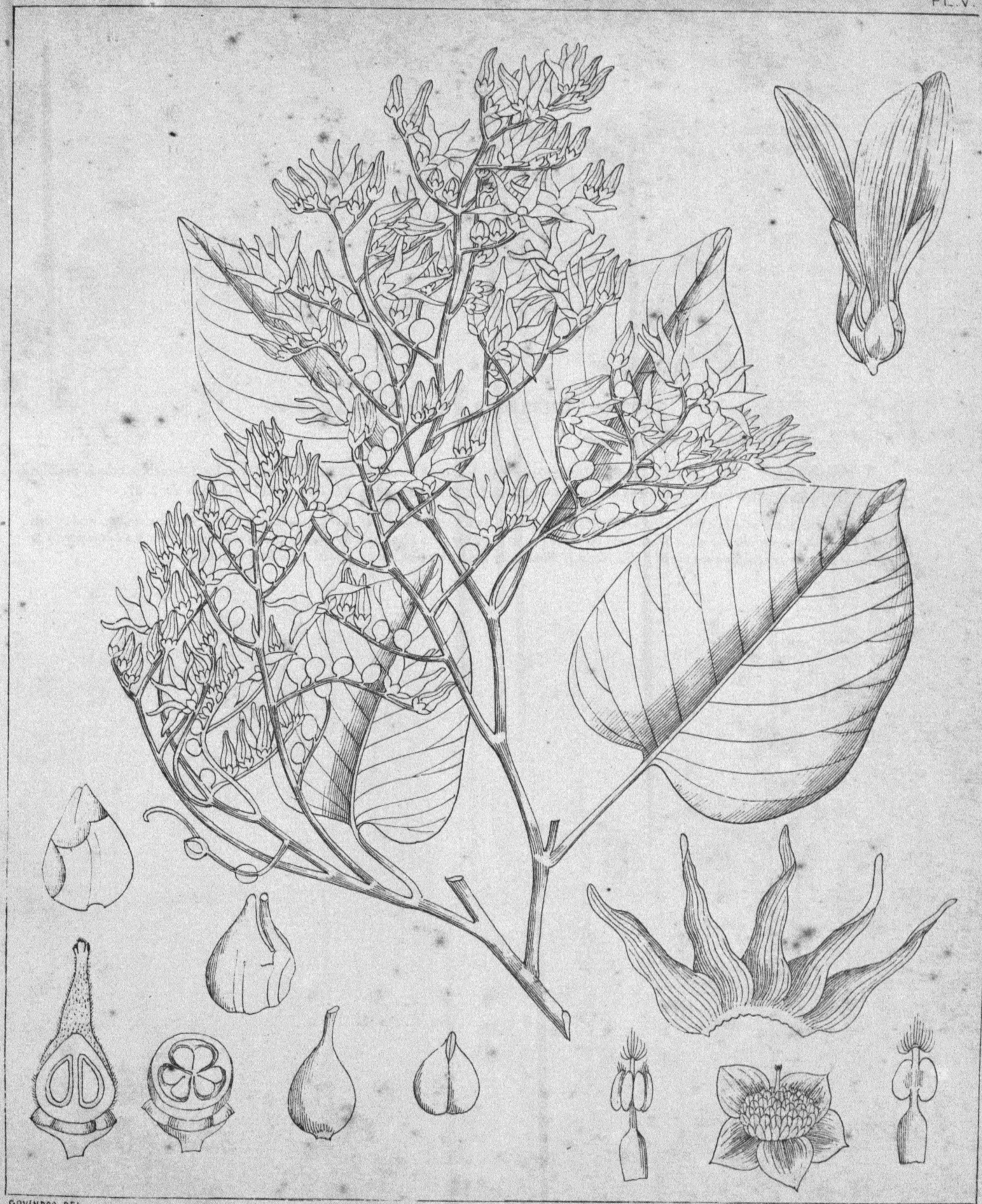
Shorea robusta. (Roxb.)

SHOREA TUMBAGAIA. (Nat. ord. Dipterocarpeæ.)

For Gen. Char. see under "Shorea Robusta."

SHOREA TUMBAGAIA. (Roxb.) Leaves long petioled, ovato cordato, 2½ to 4 inches long by 2-3 inches broad, petioles 1 to 2 inches long, panicles terminal, stamens about 100 with bearded anthers. *Roxb. Fl. Ind.* ii. 617—*Wight's Ic. t.* 27.

I have only met with this tree in the hill forests of Cuddapah and North Arcot ; it is a large tree yielding a valuable timber, and is well known in those districts under the name of Thambà: it is largely used in house building and for rafters, door frames and posts, and is exported to Madras—a dammer exudes from the trunk. The Kong of Tinnevelly is not this tree, but belongs to the allied genus Hopea.



GOVINDOO, DEL.

J. DUMPHY LITH.

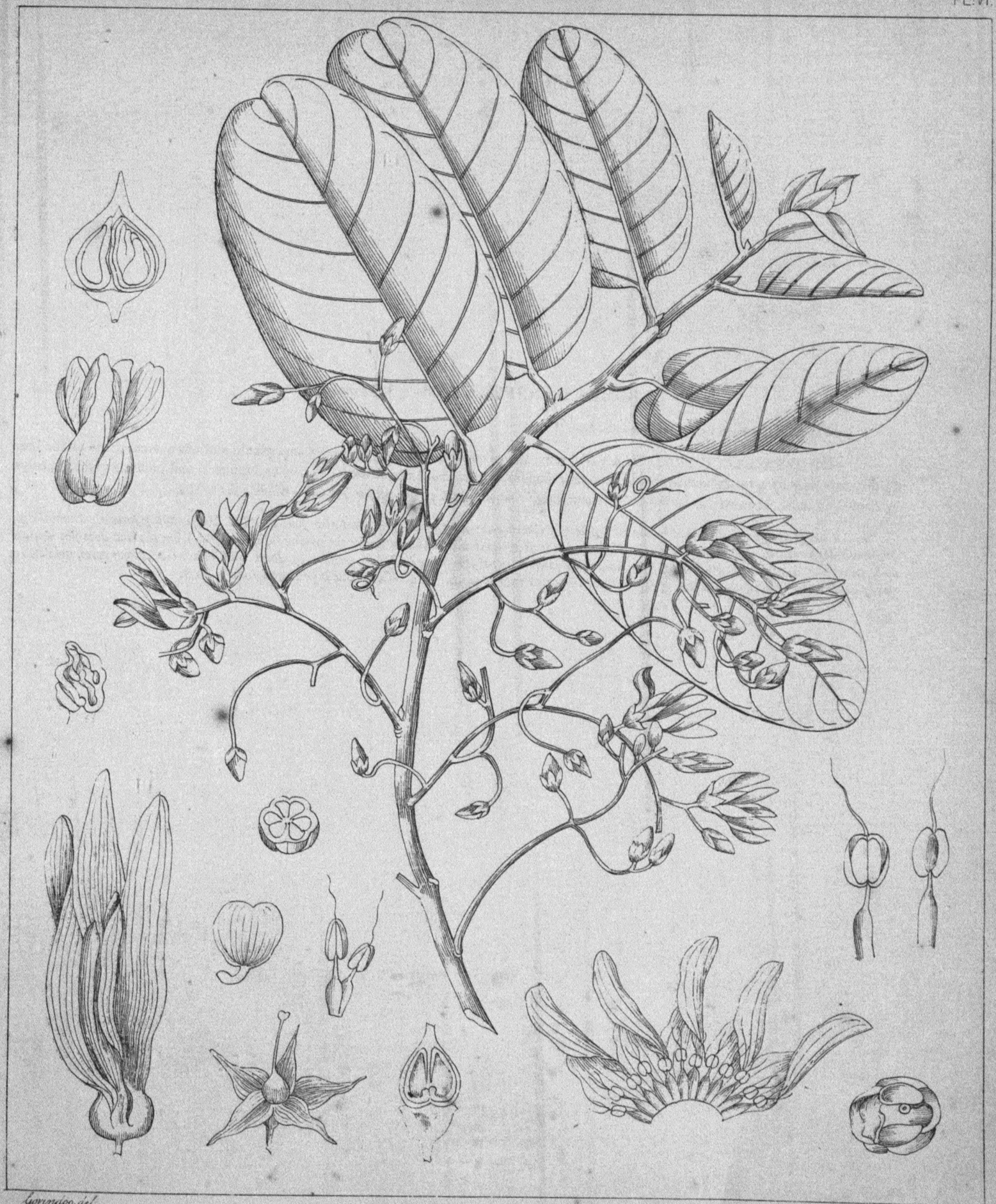
Shorea Lumbagaia (Roxb.)

SHOREA LACCIFERA. (Nat. ord. Dipterocarpeæ.)

For Gen. Char. see under "Shorea Robusta."

SHOREA LACCIFERA. (W. A.) Glabrous, leaves coriaceous oblong obtuse or emarginate and often emarginate at the base 3½-5 inches long by 2 to 2½ inches broad: panicles numerous from the axils of the fallen leaves, branches and pedicels glabrous, calyx in flower glabrous; stamens 15, anther-bristle very long. *W. A. prod. p.* 84. *under Vatica—Wight's Ic. t.* 164.

A large tree, very abundant in the hill forests of Cuddapah and North Arcot, and also found in the Mudumullay forests, Anamalloys, Wynaad, Mysore, &c. In the Cuddapah and North Arcot districts it is well known under the name of Jàllàri (Tel.), but the tree does not appear to be generally known in the other localities; its timber is very useful for house building, pannels of doors and various other purposes, and has a ready sale in the Cuddapah district, and is largely imported into Madras. A species of Lac is procured from the tree.



Gomndoo del

Shorea laccifera Roxb.

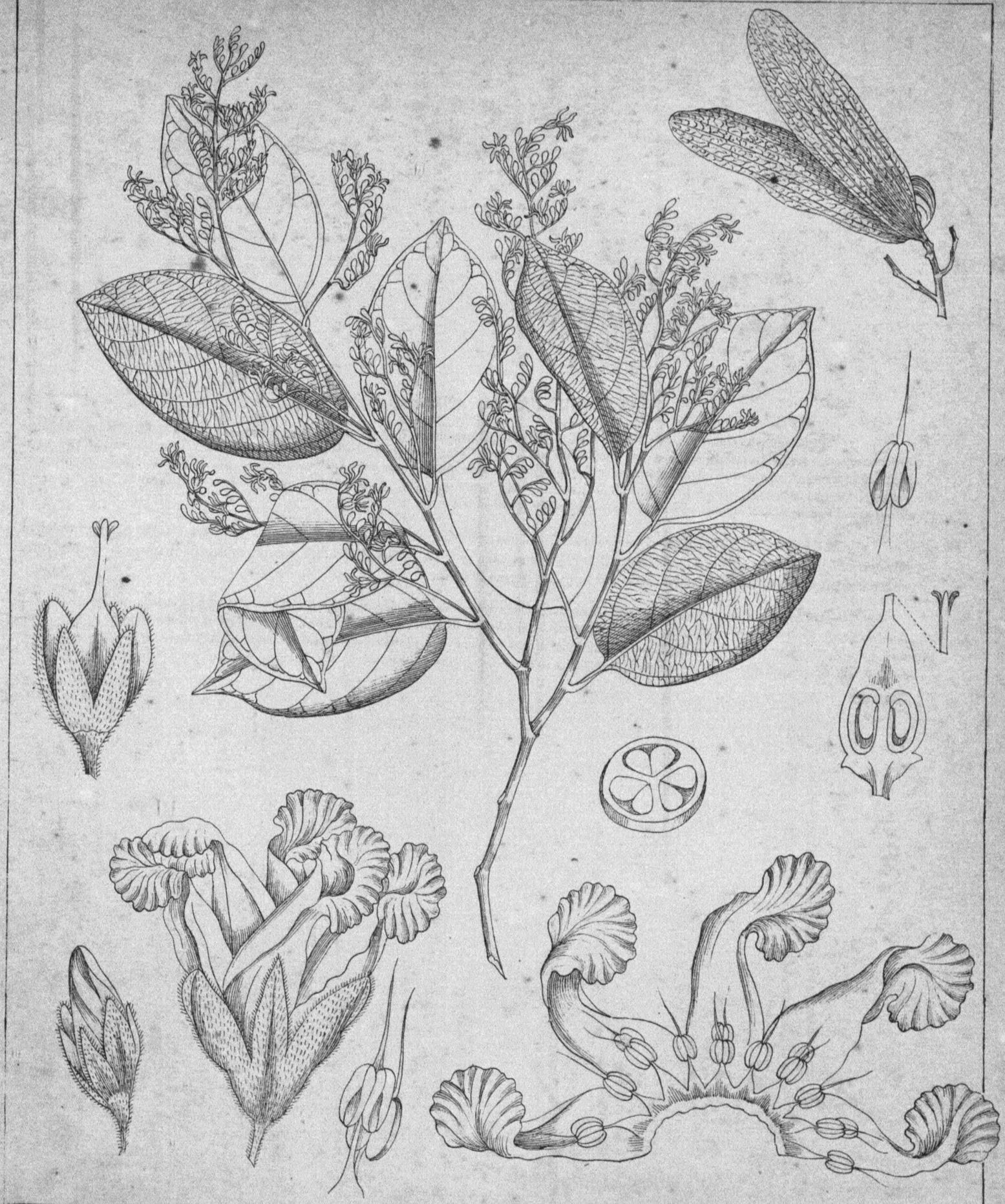
Dunphy Lith.

HOPEA PARVIFLORA. (Nat. ord. Dipterocarpeæ.)

HOPEA. (Roxb.) *Gen. Pl. p.* 193.—GEN. CHAR. Calyx tube very short adnate to the torus not increasing in fruit, divisions short obtuse often membranaceous on the margin imbricate, 2 enlarging in fruit large and wing-like erect, the rest small, all connivent over the fruit at the base. Stamens 15 rarely 10, anthers ovate, connectivum subulato-cuspidate, cells obtuse equal valved. Ovary 3 celled, cell 2 ovuled, style short terete or subulate. Fruit indehiscent, 1 seeded, seed ovoid, cotyledons thick fleshy unequal. Trees yielding resin, glabrous or tomentose, stipules small deciduous, or inconspicuous, leaves entire coriaceous—*a genus nearly allied to Shorea.*

HOPEA PARVIFLORA. (Bedd.) Petioles panicles and calyx hairy, leaves short petioled glabrous ovate to oblong furnished with glands in the axils of the veins beneath, 2 to 2½ inches long by 1 to 1½ broad, flowers secund subsessile numerous very minute, sweet scented, stamens 15 alternately single and in pairs, stigma 3 cleft.

A large handsome tree, common in both the moist and dry forests in Malabar and South Canara, up to an elevation of 3,500 *feet. The wood is hardly known commercially as yet, but it is much valued by the Natives in South Canara, and I believe it will be of great value for gun carriage purposes, and I have forwarded specimens to Madras and Bombay—it will also answer well for sleepers. In Malabar it is called Irubogam, and in South Canara Kiral Boghi on the ghats and Tirpu in the plains; in the latter district it is much valued for temple building purposes.*



GOVINDOO, DEL.

J. DUMPHY. LITH.

Hopea parviflora (Bedd.)

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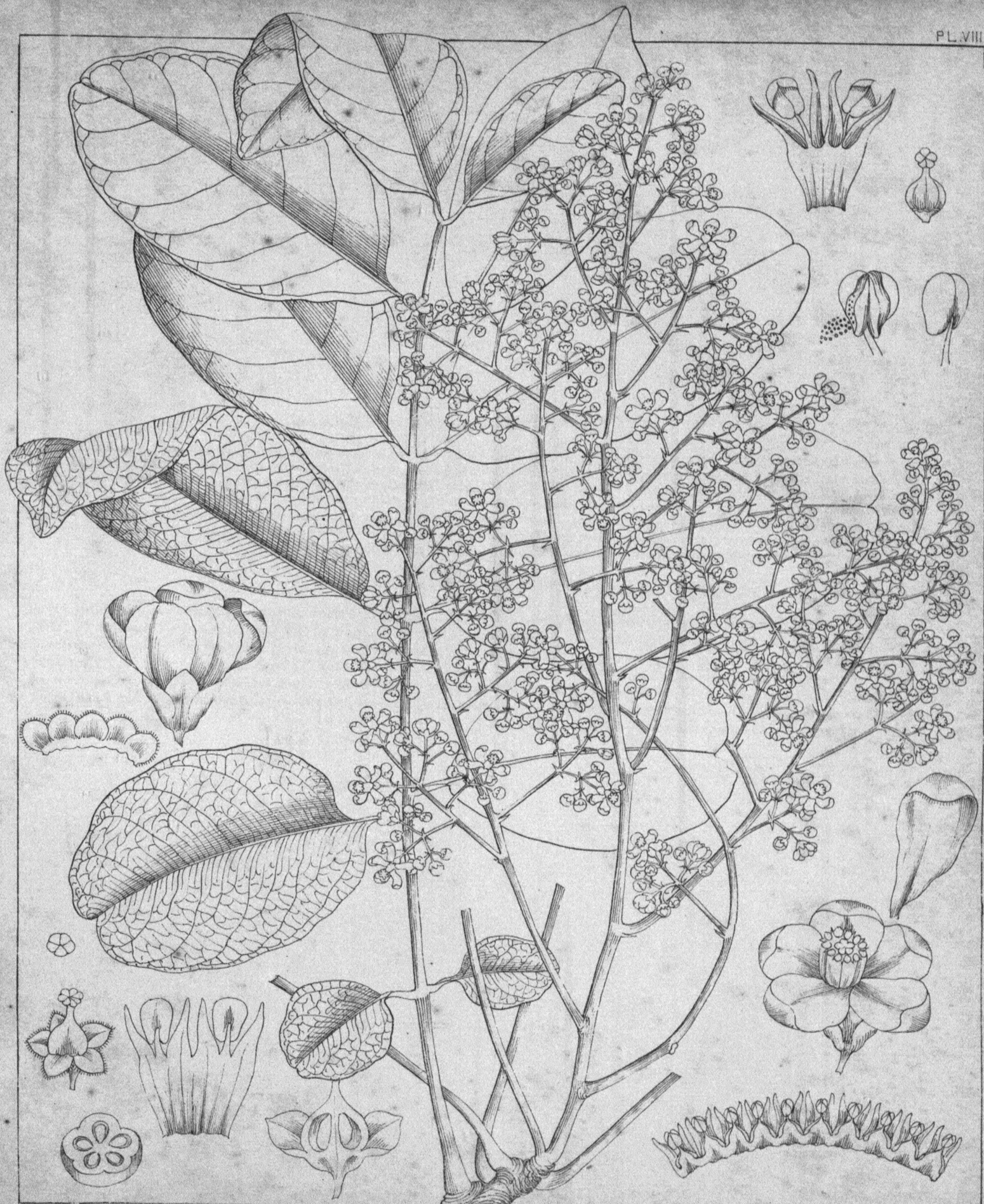
SOYMIDA FEBRIFUGA. (Nat. ord. Meliaceæ.)

SOYMIDA. (A. Juss.) *Gen. Pl. p.* 338.—GEN. CHAR. Sepals 5 short imbricate, petals 5 spreading unquiculate contorted, stamen tube short, cupuliform 10 lobed, lobes 2 toothed, anthers sessile between the teeth, disk ring-like, ovary ovoid 5 celled, style short attenuated, stigma dilated 5 sided ovules numerous in the cells in 2 series pendulous, capsule woody 5 celled 5 valved, dehiscing at the apex septifragal, the thin woody sarcocarp on each valve becoming detached from the endocarp and both from the persistent axis that is 5 angled by the dissipiments, seeds pendulous from the top of the axis imbricated in each cell, flat expanding on all sides but particularly upwards (with the hilum at the extremity) and downwards into a wing; embryo nearly straight, cotyledons 2 auricled at the apex, radicle conical pointing upwards, concealed between the auricles of the cotyledons, leaves abruptly pinnate, leaflets opposite 3-6 pair, oval-oblong obtuse, panicles large terminal or in the axils of the uppermost leaves.

SOYMIDA FEBRIFUGA. (Juss.) *Roxb. Fl. Ind.* ii. *p.* 398—*prod. p.* 122.

A tree of considerable size, not uncommon in the forests of Palghat, Cuddapah, Gumsoor, Mysore and elsewhere in the Madras Presidency and in the Central Provinces, Bombay and Bengal. It yields a valuable dull red colored wood that is highly prized by the natives for building purposes and is very durable and strong, but though well adapted for all indoor work, it is apt to split on exposure to the sun. The bark is used as a febrifuge—it is known by the names of Sohn or Rohn in Bengal, Soomi in Teligoo and Shem in Tamil, and is the red cedar of Europeans. Mr. Broughton says that the substance to which the bark owes its bitter taste has the properties of a resin and is of a yellowish white color when pure—it is sparingly soluble in water, but is unsoluble if the water contains acids; it is soluble in alcohol, ether and benzol, but these liquids do not completely separate it from foreign substances—it contains no nitrogen.



GOVINDOO, DEL:

DUMPHY, LITH:

Soymida febrifuga. (Juss.)

CHICKRASSIA TABULARIS. (Nat. ord. Meliaceæ.)

CHICKRASSIA. (Ad. de Juss.) *Gen. Pl. p.* 339.—GEN. CHAR. Calyx short cupular 4-5 toothed, petals 4-5 erect contorted. Stamen tube cylindrical 10 crenated the crenatures each bearing 1 anther, anthers ovate exserted erect, disk none, ovary oblong shortly stipulate 3 celled attenuated into a style, stigma capitate, ovules numerous in 2 series, capsule ovoid woody 3 celled septicidally 3 valved at the apex, valves 2 lamellate and separating from the 3 winged axis, seeds numerous imbricated in a double series horizontally across each cell, flat expanding downwards (at the opposite extremity of the hilum) into a wing, cotyledons orbicular not auricled, radicle superior cylindrical oblong oblique exserted applied to the edge of the cotyledons at their top—leaves abruptly pinnated, leaflets opposite and alternate acuminate, panicles terminal.

CHICKRASSIA TABULARIS. (Juss.) Leaves alternate, abruptly pinnate 6-18 inches long, leaflets 5-10 pair subopposite or alternate shortly petioled, obliquely ovato-oblong, unequal sided obtusely acuminated quite entire and increasing in size towards the apex of the leaf, hairy in the axils of the nerves beneath, stipules none, panicles terminal erect, flowers numerous rather large of a dirty white or cream color. *W. A. prod.* 123.—Swietenia Chickrassia. *Roxb. Fl. prod.* ii. 398—*Wight. Ill.*

A tree of large size, often 8 to 10 feet in girth with a thick straight trunk 60 or 80 feet to 1st bough and rust colored deeply cracked bark; found though sparingly in most of the hill forests of the Madras Presidency both in shola and deciduous forests, and in Mysore, Bombay and the Eastern parts of Bengal: it is the true Chittagong of commerce and is called Aglay or Agal in some parts of our Presidency, Madagari Vembu in others, Ganti Mille in Salem and in Bengal Chickrasee. The wood is of a light color and prettily veined and close in the grain, and is much used for furniture; it has a cedar-like smell and is one of the woods known as bastard cedars to Europeans. No attempt at cultivating this tree on any large scale has yet been made, but specimens are met with in Botanical Gardens; in Ceylon it is known under the name of Hoolanghik-gass, and its timber used in the interior of the palace of one of the Kandyan kings is known to have lasted some hundreds of years.

GOVINDOO, DEL:

DUMPHY, LITH:

Chickrassia tabularis. (Juss.)

CEDRELA TOONA. (Nat. ord. Meliaceæ.)

CEDRELA. (Linn.) *Gen. Pl. p.* 339.—GEN. CHAR. Calyx short 5 partite, petals 5 erect keeled inside on the middle, imbricate or contorted or valvate at the base, disk adnate with the stalk glandular 5 ribbed concrete between the ribs with the interposed plaits of the petals, 4-6 lobed at the apex. Stamens 4-6 inserted on the apex of the disk sometimes alternate with as many staminodes, filaments subulate, anthers oblong or cordate attached by their bark a little above the base, at first introrse at length versatile; ovary on the top of the disk, ovoid 5 celled attenuated into a style, stigma dilated, ovaries 8-12 in each cell in 2 series, pendulous, capsule coriaceous or membranaceous 5 celled, 5 valved dehiscing from the apex, septifragal, valves 2 lamellate separating from the axis which is 5 angled, seeds pendulous compressed imbricate produced downwards into a wing, albumen sparse fleshy, cotyledons subfoliaceous, radicle short superior exserted. Tall trees, leaves unequally pinnated, leaflets opposite or nearly so, many paired, unequal sided, panicles terminal flowers small.

CEDRELA TOONA. (Roxb.) Leaves abruptly pinnate, leaflets from 6 to 12 pair, ovato-lanceolate, acuminate, 2½ to 5 inches long 1¼ to 1¾ broad, slightly undulated on the margin, quite entire or slightly and distinctly toothed glabrous, panicles drooping, petals ciliated, staminodes none; ovary with a very short stalk and 8 ovules in each cell, capsule oblong. *Roxb. Fl. Ind.* i. 635.—*W.A. prod p.* 124.—*W. Ic. t.* 161.

A large tree with an erect trunk and light grey smooth bark found in almost all the forests of the Madras Presidency, Bombay, Mysore, Bengal and Birmah—it ascends the mountains to an elevation of about 4000 feet, confines itself generally to the dry deciduous tracts of forest, but is sometimes met with in sholas. It is the white cedar of Europeans, and is often but erroneously called the Chittagongwood; it is known by the name of Toon in Bengal, Suli and Mâli in the Salem district, Kal Kilingi on the slopes of the Nilgiris, and Sandani Vembu in Tinnevelly. It is often employed as an avenue tree and is much planted for this purpose in some parts of the Salem district. It grows very readily from seed, and the Forest Department have now a considerable plantation of it on the Shevaroys near Salem. The timber is well known, it is of a light rose color, strong, tolerably light and close-grained, and is much used for furniture and cabinet purposes and also for building. In Assam admirable boats are made from it. The tree flowers in April and May—its flowers are very frogrant and are used in Mysore for dying a red color called Gulinari: the seeds ripen towards the end of the rains: the bark is a powerful astringent and is useful in cases of fever, diarrhœa and dysentery, and the natives apply it when powdered externally in the treatment of ulcers. Nees, von Esenbeck has published an account of the analysis of the bark which indicoted the existence of a resinous astringent matter, a brown astringent gum and a gummy brown extractive matter resembling ulmine. The tree is called Thit-ka-do in Birmah—it is curiously quite absent from Ceylon.

Cedrela Toona

(Roxb)

Giovindoo, del

Dumphy, Lith.

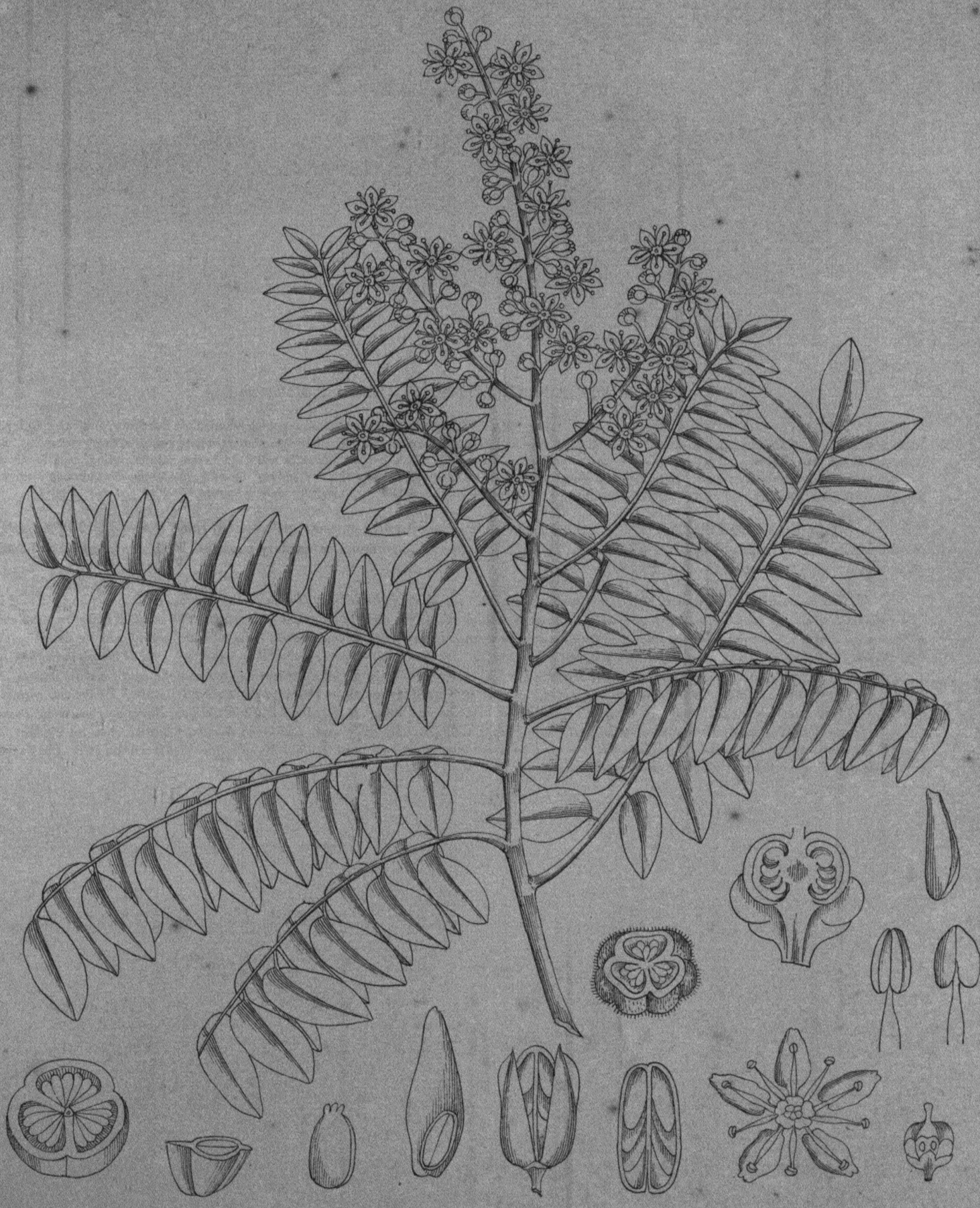
3913

CHLOROXYLON SWIETENIA. (Nat. ord. Meliaceæ.)

CHLOROXYLON. (D.C.) *Gen. Pl. p.* 340.—GEN. CHAR. Calyx short 5 parted, petals 5 patent unquiculate imbricate, disk thick 10 lobed pubescent, stamens 10 inserted into the sinuses of the disk, filaments subulate alternately longer, anthers cordate apiculate versatile, ovary pubescent half immersed in the disk depressed 3 lobed 3 celled style short, stigma obscurely 3 lobed, ovules 8 in each cell fixed to the axis ascending, capsule oblong coriaceous 3 celled, 3 valved dehiscing from the apex septifragal, seeds 4-6 in each cell ascending, extending upwards (in an opposite direction from the hilum) into a wing; embryo exalbuminous, cotyledons plano-convex, radicle short. A tree with abruptly pinnate leaves.

CHLOROXYLON SWIETENIA. (D.C.) Leaflets alternate or nearly opposite pale colored small from 10 to 20 pair, semi-cordate oblong unequal sided furnished with minute pellucid dots, flowers in terminal or axillary panicles. *W.A. prod. p.* 123. Swietenia chloroxylon. *Roxb. Fl. Ind.* ii. 400. *W. Ill.*

This is the well known Satinwood tree. It is common throughout the Madras Presidency, Mysore and in Ceylon, and is sparingly found in Bombay—it is generally found about the foot of hills and rarely ascends the slopes above a thousand feet or so. The wood is close grained and yellow, very hard and durable and excellent for turning, and is much used for furniture and picture frames as it takes a beautiful polish ; it is however very liable to warp and split if not well seasoned in the shade. It stands well under water and is used for various purposes in the Gun Carriage Manufactory. It is much cut away in the Madras Presidency, as it is highly prized by the natives for ploughs, axil trees, oil presses, &c. but especially the former, so that fine trees are rarely met with except in out-of-the-way places (such as the Collegal forests.) I have met with it 8 *feet in girth, but it is found much larger in Ceylon. A cubic foot weighs about* 56*lbs. It is called Billu in Teligoo, Burus or Purush in Tamil, Bheyroo (Oorea), in Gumsoor, Dhoura in Hindustani, Vàee mara in Tinnevelly, Billu and Huldà in Bombay, Buruta gass in Ceylon. It flowers in the hot season and ripens its seeds in the rains. I do not know of any attempts to plant it.—The tree yields a wood oil. The natives apply the leaves to wounds. "Flower Satin" is obtained from the root in Ceylon.*



GOVINDOO, DEL.

J. DUMPHY LITH.

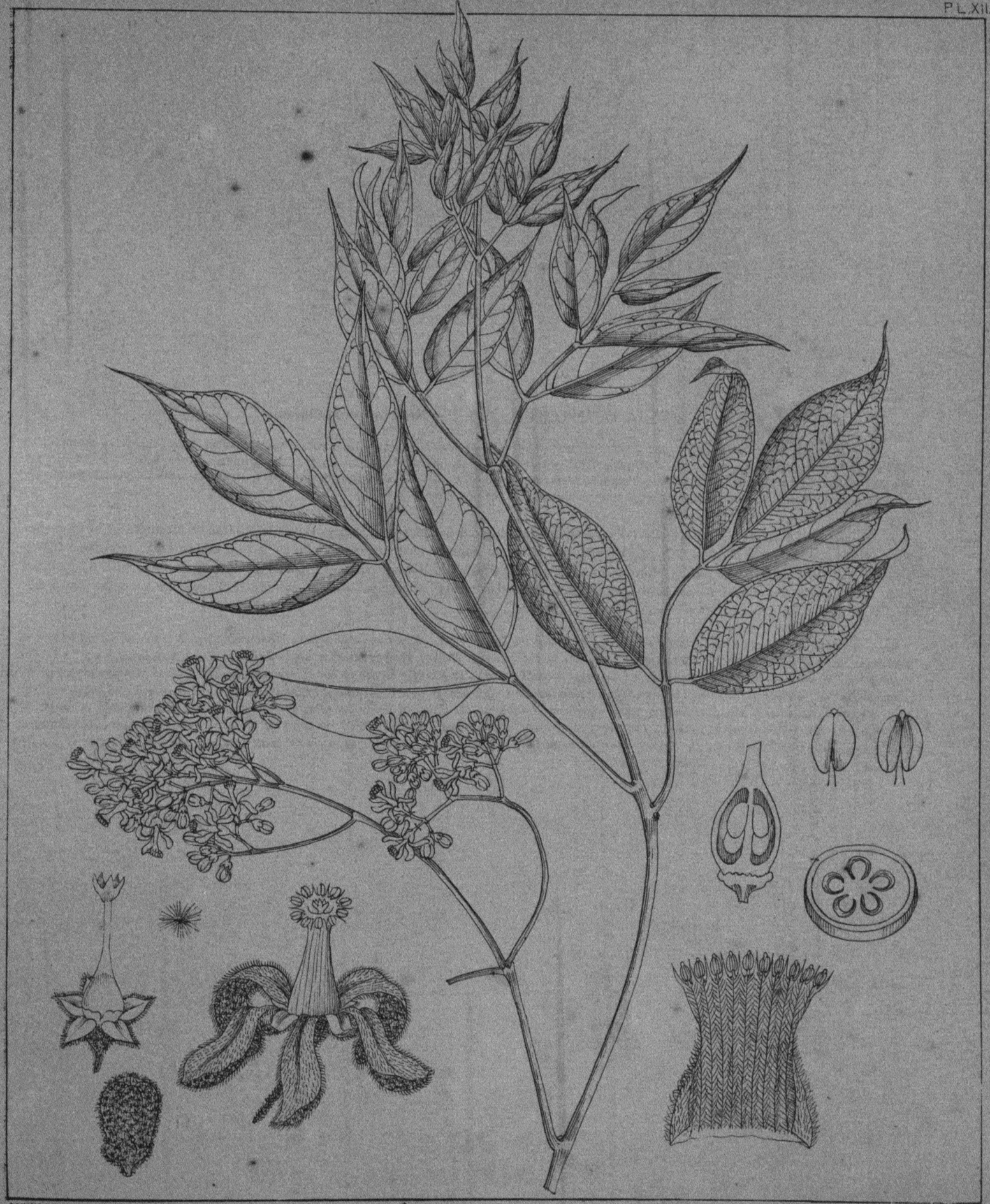
Chloroxylon Swietenia (D.C.)

MELIA COMPOSITA. (Willd.—Nat. order Meliaceæ.)

MELIA. (Linn.) *Gen. Pl. p.* 332.—GEN CHAR. Calyx 5-6, partite, lobes imbricate, petals as many as calyx lobes, spreading contorted in æstivation. Stamens 10-12 monadelphous anthers included within the slightly dilated 10-12 fid-mouth of the cylindrical tube, ovary 3-6 celled, style slender, stigma capitate, ovules 2 in each cell superposed, fruit drupaceous with a 1-5 celled bony putamen—trees, leaves alternate 2-3 pinnate (or simply pinnate), panicles ample axillary usually collected towards the ends of the branches.

MELIA COMPOSIT. (Willd.) Young shoots petioles and panicles very mealy, leaves bi-tripinnate alternate 12 to 18 inches long, pinnæ about 3 pair, leaflets 3-7 pair to each pinnæ, ovate acuminate crenulated glabrous 2 to 3 inches long, panicles axillary scarcely half the length of the leaves, flowers numerous small whitish inodorous, calyx and petals mealy, stigma large with a 5 pointed apex, drupe ovate the size of a large olive, smooth and yellowish green when ripe.—*W. A. prod. p.* 117.—Melia robusta. *Roxb. Fl. Ind.* ii. *p.* 397.—M. superba. *Roxb. l. c. p.* 396.

A very large and most handsome tree with a smooth dark brown bark. Common in Malabar, Wynaad, Coorg, Mysore, and South Canara and other parts of our Presidency. It is known to natives by the name of Mallay Vemboo which is applied also to Melia Azadarach, and its timber is often used by planters for building purposes; it may however be said to be scarcely known in our Presidency, and as a quick growing tree of great ornament it is very desirable it should be introduced to Madras and elsewhere for avenues and ornamental planting—it seeds well and grows readily from seeds. Seeds sent by Dr. Berry many years ago from Malabar to the Calcutta Botanical Gardens produced in 7 years trees of a height of 46 feet and a circumference of 44 inches 4 feet from the ground. It is common in Ceylon and is known by the native name of Lunu Midellà, and Mr. Ferguson of that Island says the timber is very light and cedar-like and in use for outriggers of boats and for ceilings, and that it is said white-ants will not attack it.



GOVINDOO, DEL.

DUMPHY, LITH.

No. 6

Melia composita (Willd.)

MELIA AZADIRACHTA. (Nat. ord. Meliaceæ.)

For Gen. Char. see under "M. composita."

MELIA AZADIRACHTA. (L.) Leaves simply pinnate, leaflets ovate lanceolate, unequal sided, acuminated serrated, panicles axillary, flowers small white, fruit purple size of an olive, 1-celled 1-seeded. *Roxb. Fl. Ind.* ii. 394 ;—Aria bepou. *Rheede Mal.* 4 to 52. Azadirachta Indica, *Ad. de Juss.*;—*W. A. Prod. p.* 118.

This has been separated from the genus Melia under the name of Azadirachta by Ad. de Juss. on account of its 1-celled, 1-seeded *nut. Hook and Bentham, however, unite the* 2 *genera.*

Called in Hindoostani the Nim, by which name the tree is well known throughout India. It is an ornamental tree, and is very much planted in avenues and topes ; it is common throughout India, Birmah, and Ceylon, generally in a planted state, though occasionally in the forests ; it grows well in almost any soil in the plains, and occasionally attains a very large girth. It is called Veypam in Tamil, Yépà or Yepò in Telugoo, Kohomba in Ceylon, and is the Margosa tree of Europeans. The wood is very like mahogany, beautifully mottled, hard and heavy ; it is much used for cart wheels and ordinary building purposes, and old trees yield a first-rate furniture wood which is well adapted for ship-building ; it is much used in Bengal in the manufacture of idols, as it is so bitter that no insect will attack it. The bark is very bitter and is used as a substitute for Quinine, the leaves beaten into a pulp are externally applied with great efficacy in case of pustular eruptions in rheumatism, and for bruises, and sprains, and the leaves are said to be useful in keeping away the boring worm from books ; the dried leaves are often added to common poultices by the natives, and are said to act in preventing glandular tumours from coming to maturity. The fruit yields an acrid bitter oil, which is exported from the Madras Presidency ; it is said to have valuable antispasmodic properties, and is anthelmintic and stimulant. It is used by the natives as a remedy in leprosy and as a liniment for rheumatic affections ; it is obtained by boiling or expression, is of a deep yellow color, and is used for burning in lamps. The bark yields a gum which is said to be a stimulant. A toddy, called Veypam Khalloo, is obtained from young trees

Govindoo, del:

Dumphy, Lith:

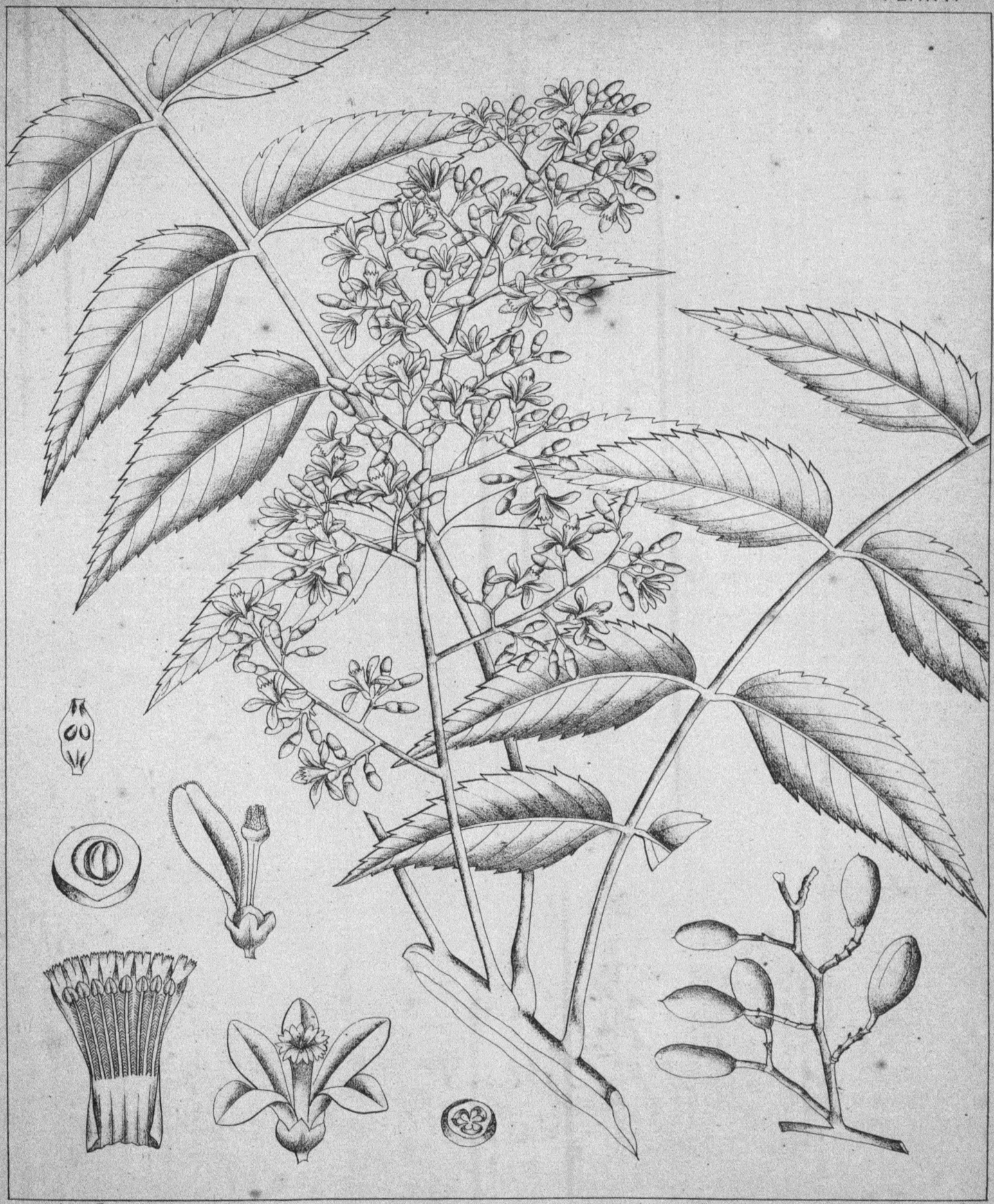
Melia Azedarach (Linn:)

MELIA AZEDARACH. (Nat. ord. Meliaceæ.)

For Gen. Char. see under "M composita"

MELIA AZEDARACH. (L.) Leaves deciduous 1-2 feet long, bipinnate glabrous, leaflets about 5 obliquely lanceolate, or ovate lanceolate to elliptical acute or acuminate, serrate inciso-serrate or entire, petals nearly glabrous, fruit with a 5-celled putamen or by abortion with fewer cells. *W A. Prod. p.* 117 ;—*D. C.* i. 621 ;—*Roxb. Fl. Ind* ii. 395.

A handsome tree, attaining a height of about 40 feet and a quick grower; it produces its sweet-scented lilac-like flowers in the hot season It is found sparingly as a planted tree throughout the Madras Presidency, Bengal, Mysore, Bombay, &c., but rarely if ever met with in the jungles; it is a very ornamental tree and deserving of more attention. It is wild in China and in Africa, and has been naturalized in the South of Europe; the wood of older trees is handsomely marked, rather durable and in use for furniture; it is often called Bastard Cedar, and is apt to warp and split; the tree is called Mallay Vembu in Tamil, Taraku vepà in Telugoo, and in English is known as the Persian Lilac;—the seeds are often strung as beads, and a valuable oil is produced from them; the root is nauseous and bitter, and in use as an anthelmintic.



Govindoo, del. Dumphy, Lith.

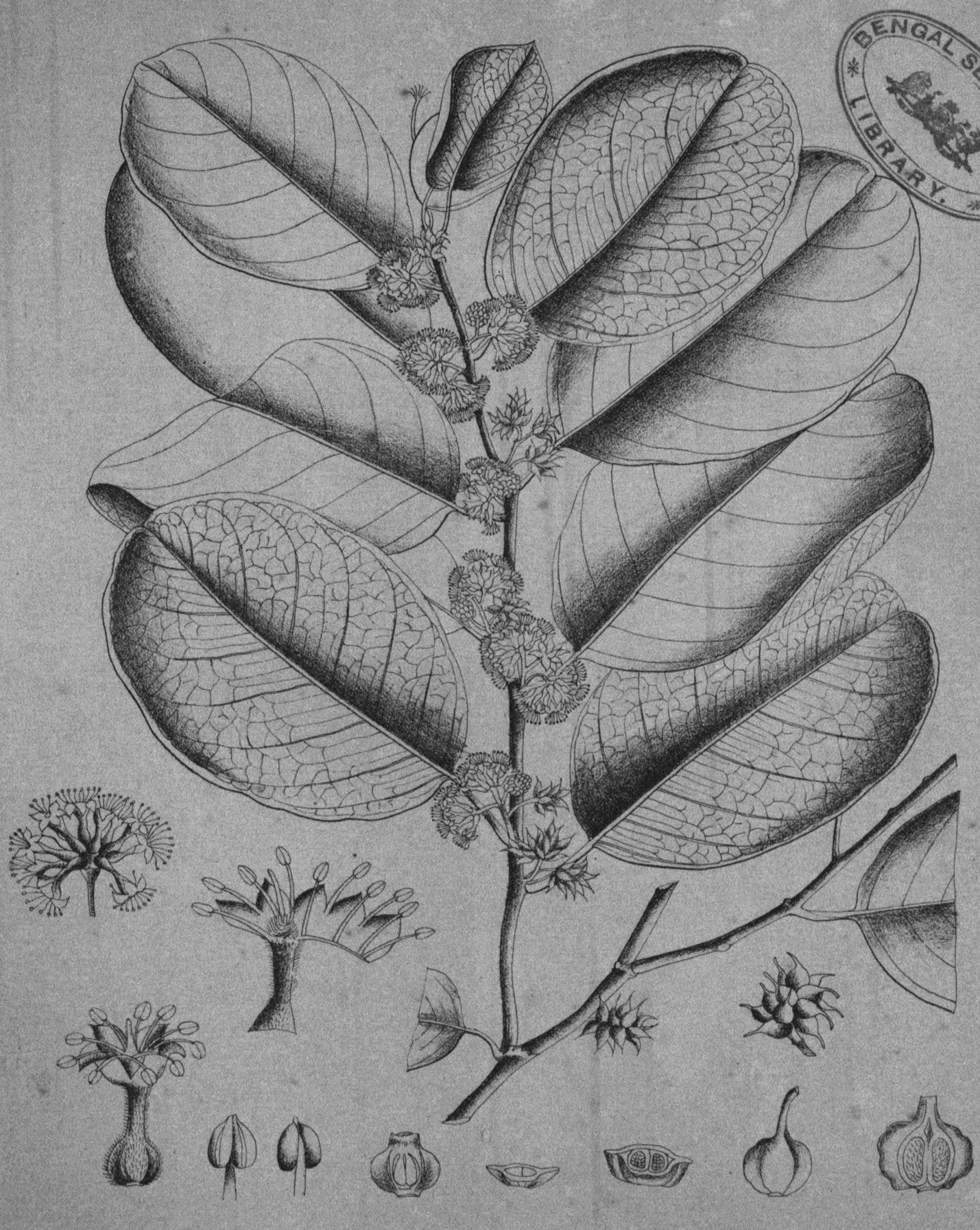
Melia azadiracta (Linn.)

ANOGEISSUS LATIFOLIUS. (Nat. ord. Combretaceæ.)

ANOGEISSUS (Wall.) *Gen. Pl. p.* 687.—GEN. CHAR. Flowers densely aggregated on a common receptacle, calyx tube compressed 2 winged at the base, attenuated and much produced beyond the ovary and resembling a pedicel to the limb, limb campanulate or urceolate 5 fid deciduous, lobes valvate, petals 0. stamens 10 in 2 series, filaments filiform subulate exserted, anthers small cordate, ovary 1-celled, style filiform, thickened at the base villous, stigma simple, ovules 2 pendulous from the apex of the cell. Fruit small, broadly trapezoid, 2 winged terminating in a long beak (the persistent calyx tube) 1-seeded. Seed ovoid, cotyledons convolute, trees or shrubs glabrous or sericeous, leaves alternate petiolate entire without glands or obscurely glandular at the base, flowers small yellowish, capitula axillary.

ANOGEISSUS LATIFOLIUS. (Roxb.) A lofty tree, 30 to 40 feet to the first branch, and up to 8 or 9 feet in circumference, bark smooth of a whitish color, branches numerous, spreading, forming a large high head, leaves alternate without glands elliptical or obovate obtuse or emarginate glabrous from 1 to 4 inches long and from 1 to 2 broad, peduncles axillary bearing several ramifications each supporting a little globular head of small yellow flowers *Wall. L. n.* 4015;—Conocarpus latifolius, *Roxb. Fl. Ind.* ii. 442.

This is a very valuable timber tree, common throughout the Madras Presidency, Mysore, Bombay, Bengal and Ceylon, and attains a large size on many of our mountains; it is common in the plains, and ascends the mountains to an elevation of about 3,000 feet; it is known by the names of Chirman and Sherman and Yella Maddi in Teligoo, Vellay nàju and Veckalie in Tamul, Dhobu in Oorea, Dhowrà and Dhàori in Hindustani and Mahratta, and Dàsu in Ceylon. Its wood is light colored with a purple heart; it is close-grained and very durable when properly seasoned, it is much used in house building and in ship building, and is one of the best woods for poles and axle-trees of carts, and is much used by the natives for agricultural implements. If left in the forests exposed to weather the wood rapidly deteriorates and is soon attacked by insects and white ants,—the wood from small trees wants the dark colored heart and is anything but durable. Except a few specimens in Botanical Gardens, there have been no attempts at planting this tree. The leaves are used by tanners. A gum exudes from the bark which is collected (as Dhaori kè gond) in Central India, and sold in the bazaars.



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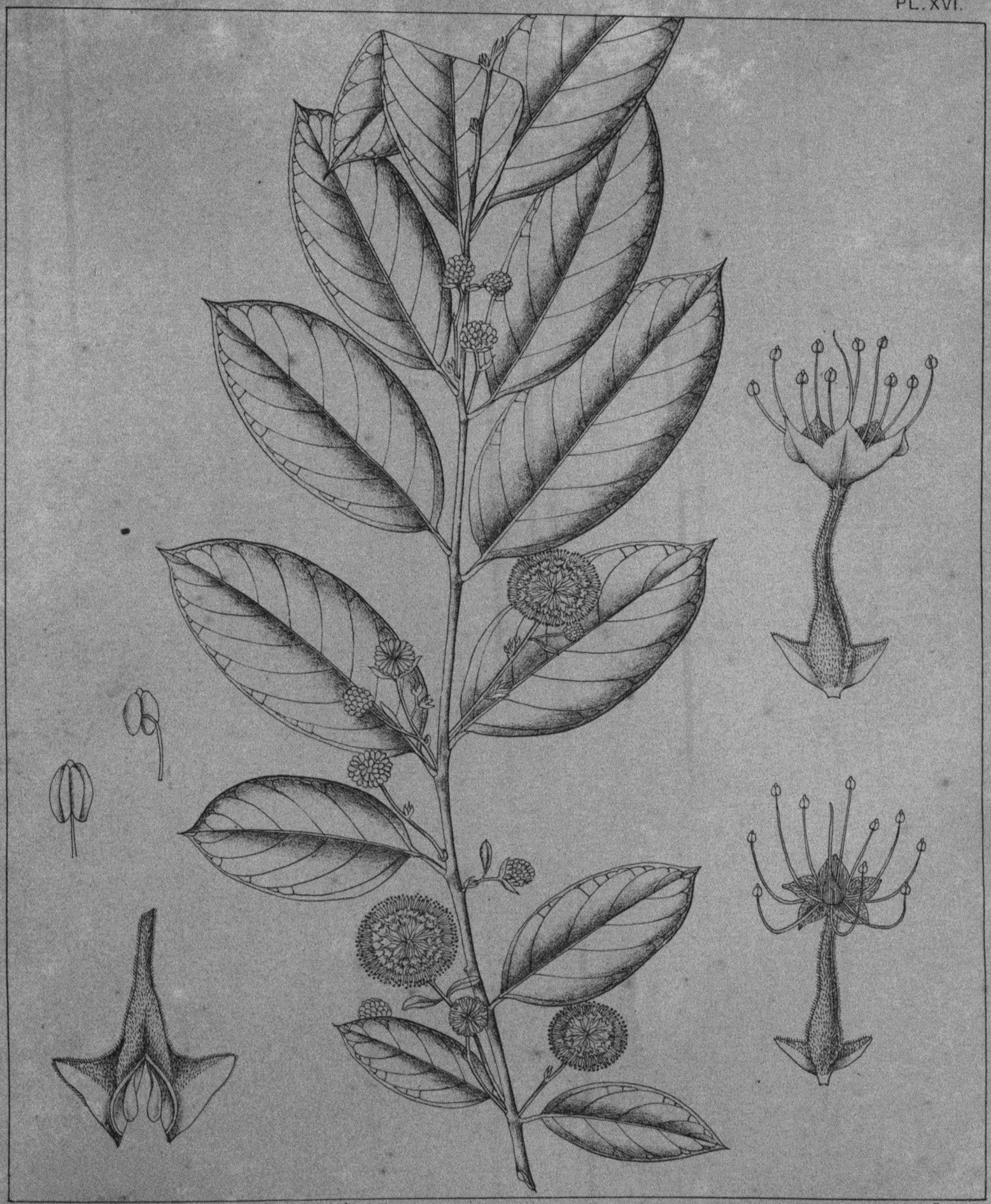
Govindoo, del. *Anogeissus latifolius (Roxb.)* Dumphy, Lith.

ANOGEISSUS ACUMINATUS. (Nat. ord. Combretaceæ.)

For Gen Char. see under "A latifolius"

ANOGEISSUS ACUMINATUS. (Roxb) A lofty tree, but trunk seldom straight, up to 8 feet in girth, bark ash-colored, branches very numerous, spreading with their extremities pendulous (like the Weeping Willow) the whole forming a most beautiful large regular top, leaves short petioled alternate without glands oval or oblong-lanceolate pointed entire, when young downy when old smooth, about 2 to 3½ inches long and 1 to 1½ inch broad, peduncles axillary single simple with one head of flowers or occasionally with a second branch. *Wall L. n.* 4014;—Conocarpus acuminatus, *Roxb. Fl. Ind.* ii. 443.

A valuable and very ornamental tree, abundant in the Northern Circars, particularly in the Gumsur country (in the plains); but I have never observed it wild elsewhere in our Presidency. It is known by the Telugoo name of Pavlchman. Dr. Brandis has found it in Burmah, where it is called Yoong. Its timber much resembles the preceding species, and has a purple heartwood; it is much used for building purposes, but will not stand exposure to water. The tree grows very well at Madras (there is a splendid specimen in the compound of the house known as the Collector's at Sydapett), and I have lately given some attention to raising it from seed, but all the plants at present are very young. It is certainly one of the most ornamental trees in our Presidency, and I hope ere long it will be largely planted; it is growing in the Calcutta Botanical Gardens.



Govindoo, del. Dumphy, Lith:

Anogeissus acuminatus (Roxb:)

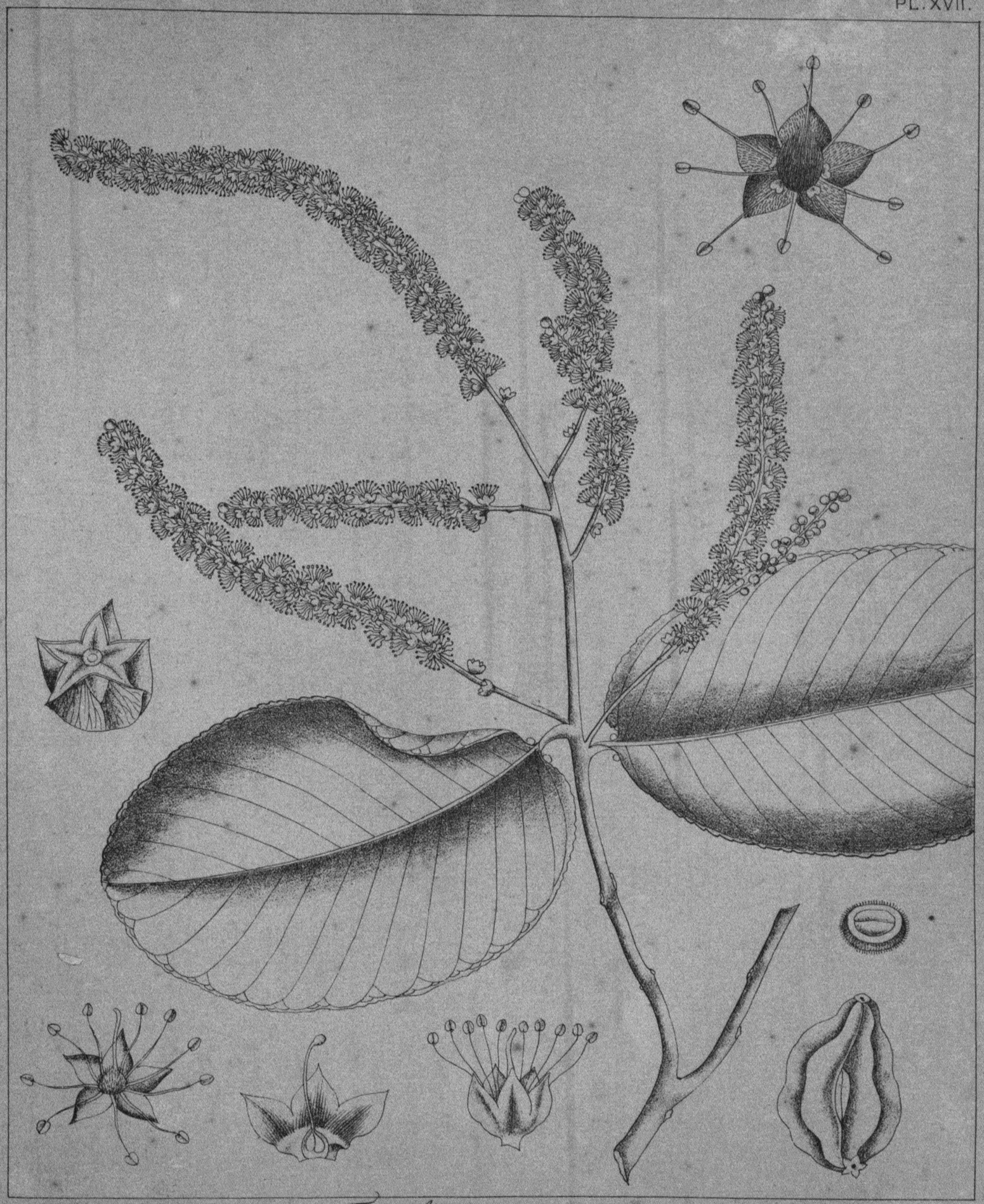
TERMINALIA TOMENTOSA. (Nat. ord. Combretaceæ.)

TERMINALIA. (L.) *Gen. Pl. p.* 685.—GEN. CHAR. Flowers hermathrodite or polygamo-diœcious, calyx tube ovoid or cylindrical, constricted above the ovary, limb deciduous urceolate or campanulate 5 dentate or 5 fid, lobes valvate, petals O. stamens 10 in 2 series alternately larger filaments subulate or filiform exserted, anthers small didymous. Ovary 1-celled style subulate, often thickened and villous at the base, stigma simple ovules 2, rarely 3, pendulous from the apex of the cell, fruit ovoid, angled, compressed or 2-5 winged 1-seeded, sarcocarp generally thin or O. rarely fleshy, putamen coriaceous or bony seed almond-like, testa membranaceous, cotyledons convolute. Trees or erect shrubs, leaves alternate or rarely opposite or sub-opposite, often crowded towards the apex of the branches, with glands on both sides at the base or on the midrib, or glandless, flowers spiked sessile small, green or white, rarely colored, bisexual in the lower part of the spike, male in the upper.

TERMINALIA TOMENTOSA. (Roxb.) A very large timber tree, often 70 or 80 feet to the first bough, and up to 12 feet in girth; bark deeply cracked (or in one variety without any cracks), branches spreading, leaves sub-opposite short petioled oval, with a cordate (often unequal) base, to oblong or narrow-oblong obtuse or emarginate or slightly acute at the apex, entire or crenulated glabrous on both sides or more or less downy especially when young, up to 6 inches long by 4 broad, glands several on the midrib below generally near the base sessile or rarely stalked, panicles terminal or from the upper axils composed of a few simple long cylindric spikes, flowers sessile crowded of a dull yellow color generally hermathrodite below and male above, sometimes all hermathrodite, calyx glabrous or hoary, sometimes with 5 or 6 glands in the hair round the base of the syle, fruit enlarged into 5-7 equal longitudinal wings glabrous or rarely hoary. *W. A. Prod. p.* 314;—*Roxb. Fl. Ind.* ii. *pp.* 438, 439 and 440;—Terminalia crenulata, glabra, tomentosa, and coriacea, *W. A.*; Terminalia alata, *Ainslie*; Pentaptera glabra and tomentosa, *Roxb.*; Pentaptera coriacea, *Roxb.*; Pentaptera crenulata, *Roxb.*

This is one of our most useful timber trees; it is common throughout the Madras Presidency up to an elevation of 3,000 *or* 3,500 *feet, and grows to a very large size and very straight on the Anamallays, and very fine on the Nullaymallays (Kurnool), where the timber is highly prized, and more in use than any other; it is also common in Mysore, Bengal, Bombay, and Ceylon. It is called Sâj in Hindustani, Sâhajo in Oorea, Karrà Mardà in Tamil, Maddee and Nallà Maddee in Telugoo, Matti in Canarese, and Koombook in Ceylon. The* Terminalia glabra of Roxb. *only differs in being more glabrous and having the bark nearly smooth, but the pubescence varies much, and I cannot look upon the two trees as distinct species. It is distinguished by the Telingees as Tella Maddee. The Banipu of the South Canara forests (probably* Pentaptera crenulata, Roxb.*) is also, I believe, only a variety of the same species, or at least closely allied; it differs in having very long stalked glands,* ½ *an inch long, on the midrib below, often up as far as the centre of the leaf; the tree does not, however, differ otherwise.*

Wood, dark-colored very hard, heavy, and strong, much used in house building, and for boats and canoes, solid wheels of carts, furniture, and many other purposes. The ashes from its burnt bark produce a kind of chunam which is eaten by the natives with betel leaf; the bark is astringent, and used for dying black and for tanning. This tree has been introduced into several of our plantations.



Govindoo, del.

Terminalia tomentosa (Roxb.)

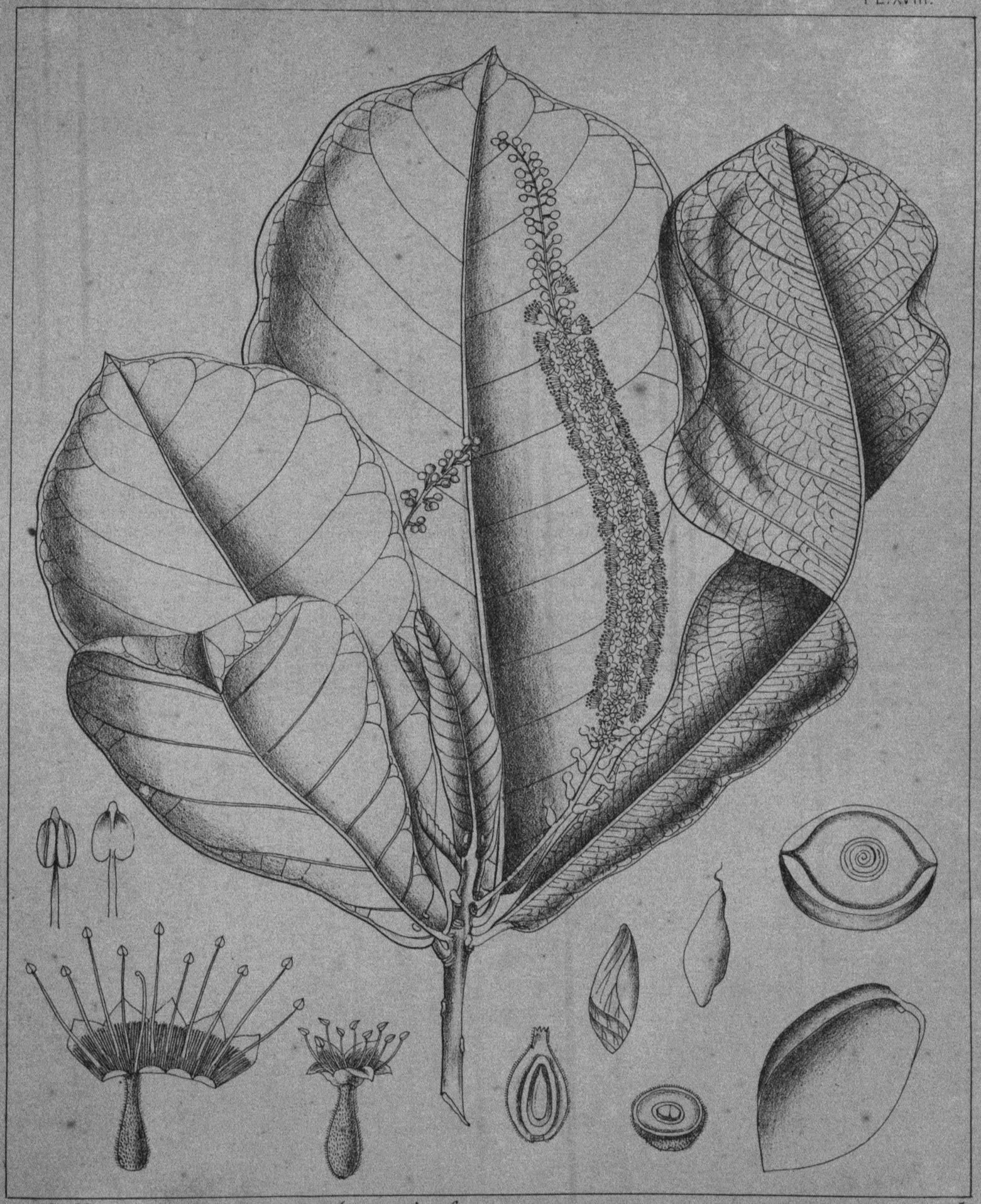
Dumphy, Lith.

TERMINALIA PANICULATA. (Nat. ord. Combretaceæ.)

For Gen. Char. see under "Terminalia tomentosa."

TERMINALIA PANICULATA. (Roxb.) A fine large timber tree, branches diverging, leaves nearly opposite oblong to linear oblong with a more or less cordate base, acute or obtuse at the apex, entire, coriaceous, rugose above glabrous or rarely pubescent, with 2 sessile umbilicate glands beneath near the base, or glandless, spikes terminal forming a compound panicle, fruit with one large and two small wings. *W. A. Prod. p.* 315 ;—Pentaptera paniculata, *Roxb. Fl. Ind.* ii. 442.

A valuable timber tree common in most of the forests on the western side of the Madras Presidency, up to an elevation of 2,000 *or* 3,000 *feet, and also found in Bombay and Bengal, called Marwà in South Canara, Poo Mardà and Pillah Murdà in the Anamallays and Malabar. Dr. Roxburgh gives Pe Karkai as the Tamil name, and Neemeeri as Teligoo, but I never met with any one who knew either of these names. It is often called simply Matti or Mardah, the same name given to Terminalia tomentosa ; it is known by the name of Keerijul in the South Concan, where it is common along the foot of the Ghats. The timber is very good, but not equal to that of Terminalia tomentosa ; it is said to be improved by being kept under water. The bark contains tannin. The tree is not found in Ceylon, nor is it recorded from Birmah ; the tree grows in the Botanical Gardens in Calcutta, where seedlings attained a height of* 20 *feet with a circumference of* 18 *inches in eight years ; it has been introduced into our plantations at Nellumbur, and grows well from seed.*



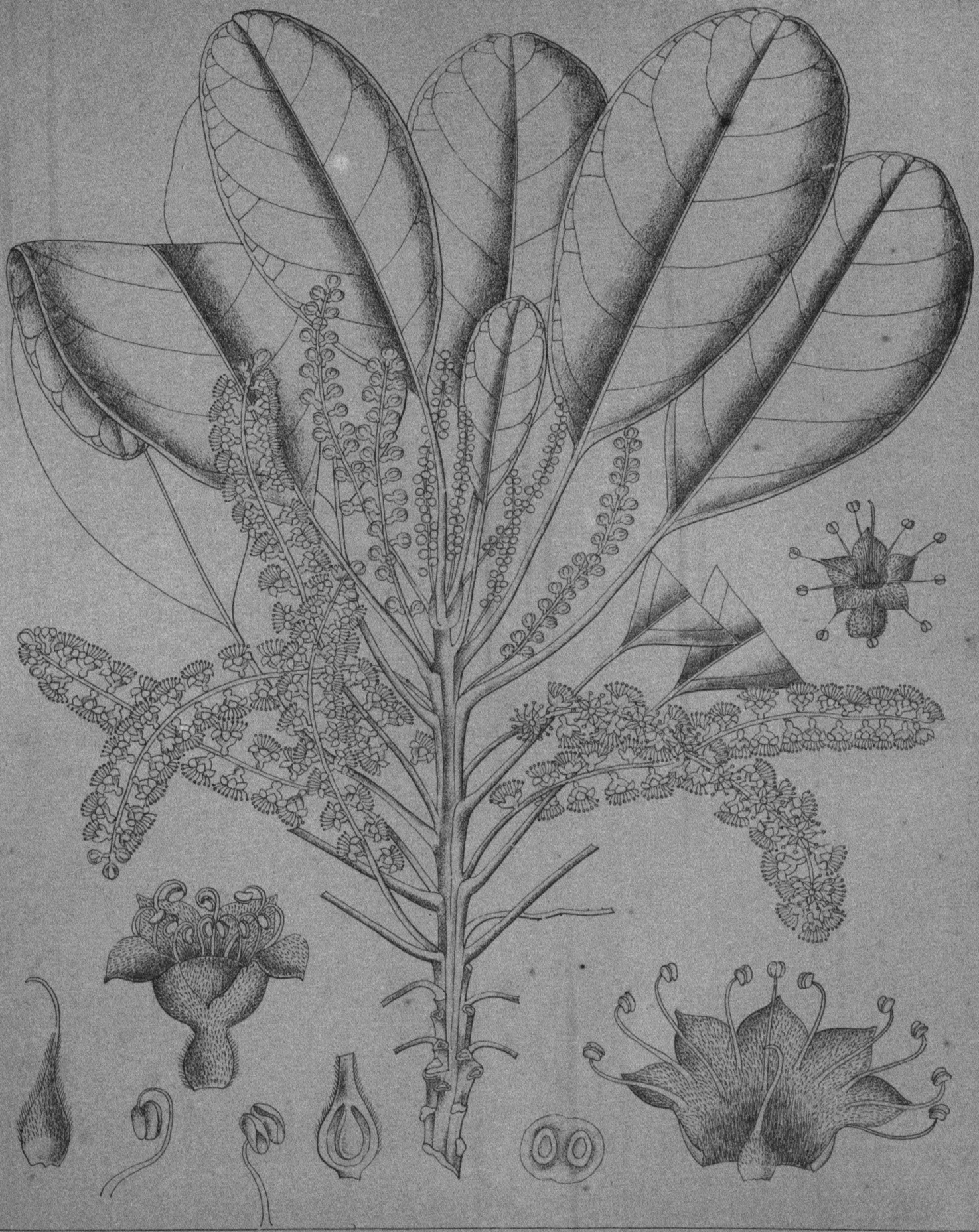
Govindoo, del. Terminalia Catappa (Linn.) Dumphy, lith.

TERMINALIA BELERICA. (Nat. ord. Combretaceæ.)

For Gen. Char. see under "Terminalia tomentosa."

TERMINALIA BELERICA. (Roxb.) A very large tree, with an erect trunk and large spreading head, flowering in the hot season, leaves crowded about the extremities of the branches, long petioled, oval to obovate obtuse or shortly acuminated, quite entire glabrous above and generally also beneath, 6 to 7 inches long by 2½ broad, with 2 opposite glands on the upper side of the apex of the petiole and sometimes near the base, spikes axillary solitary simple erect almost the length of the leaves, flowers small dirty-grey fetid, the male towards the apex of the spike and shortly pedicellate with a glandular disk at the bottom of the calyx, hermathrodite below and sessile, drupe obovate obscurely 5-angled, the size of a nutmeg, fleshy, covered with grey silky down. *Roxb. Fl. Ind.* ii. *p.* 341;—*W. A. Prod. p.* 313.

This fine large tree is common throughout the Madras Presidency, Bengal, Bombay, Birmah and Ceylon; it is universally known in this Presidency by the name Thani, which is both Tamil and Telugu, in South Canara it is called Santi, in Bengal Bahera, in Bombay Bherda, in Birmah Titseim, and in Ceylon Bulu. The wood is white and rather soft, but much used in some parts of the Presidency, and said to be tolerably durable; it answers well for packing-cases and coffee boxes, and catamarans and grain measures are made from it, and in Malabar and South Canara the tree is sometimes hollowed out for canoes; the kernels of the fruit are eaten by the natives, and also used medicinally; the fruit is used in dying and tanning, and the leaves also for the latter purpose; the dried fruit is said to be astringent and laxative (as the Ægle fruit); an oil is expressed from the seed, which is used for strengthening the hair, and a gum issues from wounds in the bark. The tree has been introduced into the Calcutta Botanical-Gardens.



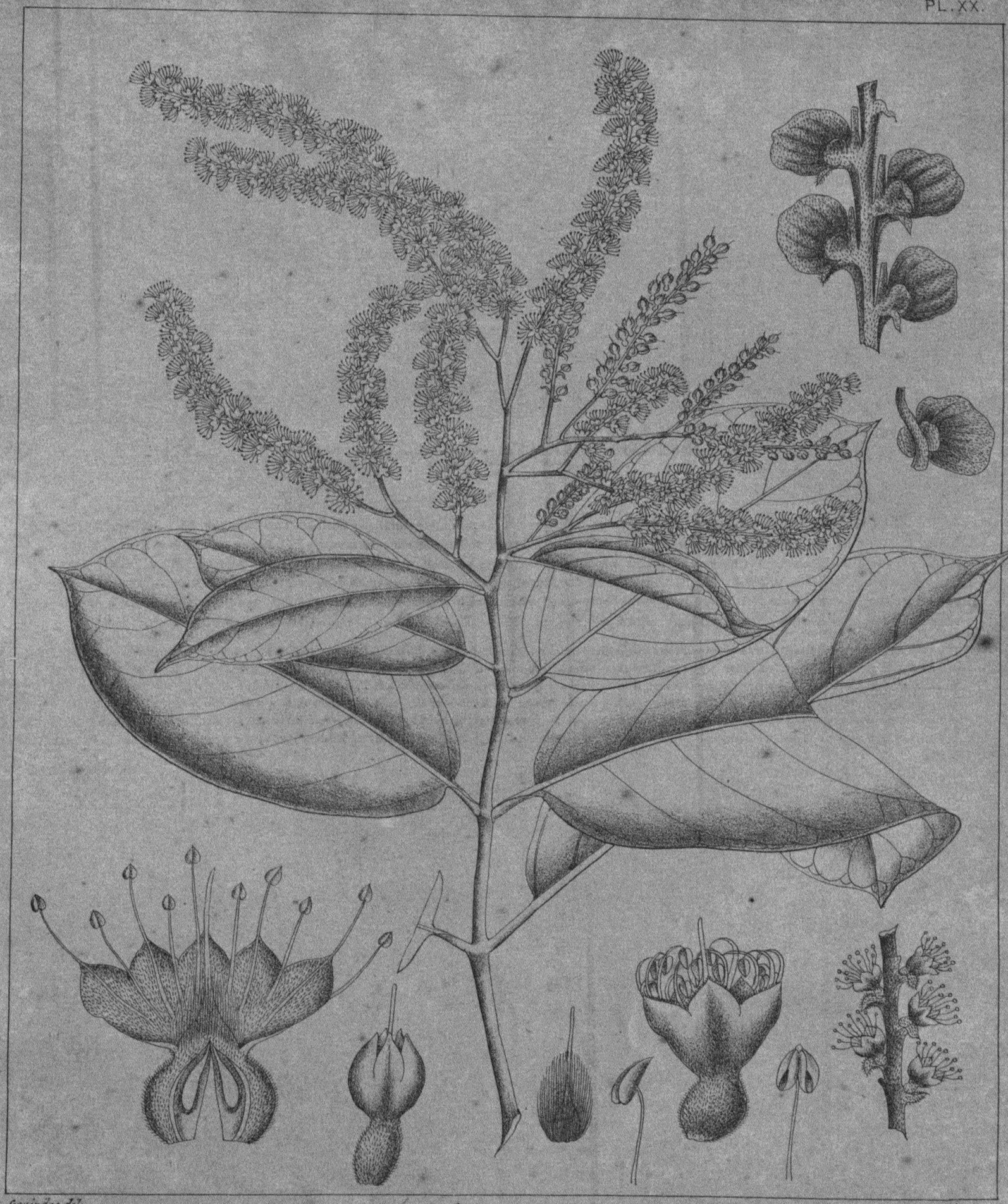
Govindoo, del. Terminalia Belerica (Roxb.) Dumphy, Lith.

TERMINALIA CATAPPA. (Nat. ord. Combretaceæ.)

For Gen. Char. see under "T. tomentosa."

TERMINALIA CATAPPA. (Willd.) A large tree, branches horizontal verticelled, bark smooth, of a dull olive color whilst young, leaves about the extremities of the branches glabrous subsessile obovate crenate and attenuated, but at the same time slightly cordate at the base ; a little repand with a large depressed gland beneath on each side of the midrib near the base, from 6 to 12 inches long, racemes axillary solitary simple shorter than the leaves, flowers numerous, small dull whitish, male most numerous above the hermathrodite, bracts minute deciduous, drupe oval compressed smooth with elevated navicular margins, convex on both sides, yellowish when ripe, nut oblong with a rough surface. *Roxb. Fl. Ind.* ii. 430 ;—*W. A. Prod. p.* 313 ;—Adamaram, *Rheede Mal.* iv. *t.* 3, 4

A highly ornamental tree much planted throughout the Presidency, and met with in some of our forests, but doubtfully indigenous ; it is in flower and fruit throughout the year ; it is called the Indian Almond tree by Europeans, in Hindustani, Badam or Junglibadam, and in Malabar Nat vadom. It makes a good avenue tree, and is well worthy of extended cultivation. The wood is light but tolerably durable, and is used for various purposes, and the levers of Pakottahs are often made of it ; the kernels of the nuts are eaten and are very palatable; the oil expressed from the seeds is very like Almond oil, and the oil cake is used to feed pigs ; the bark and leaves yield a black pigment with which the natives color their teeth and make into Indian ink ; the juice of the leaves and milk of the nut are used medicinally; the tussa silk-worms feed on the leaves.



Govindoo, del.

Terminalia paniculata (Roxb.)

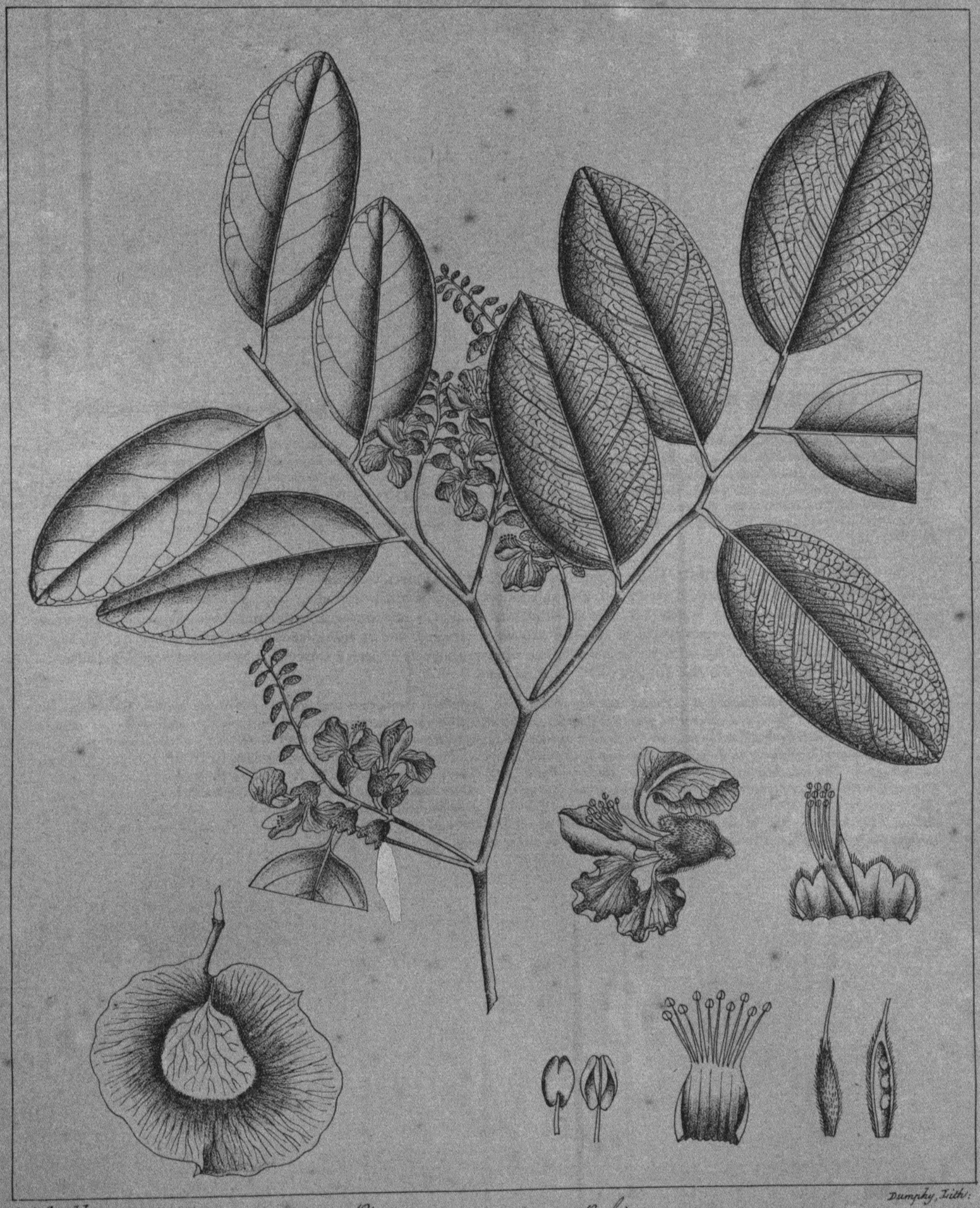
Dumphy, Lith.

PTEROCARPUS MARSUPIUM. (Nat. ord. Leguminosæ; Sub-order Papilionaceæ; Tribe Dalbergieæ.)

PTEROCARPUS. (Linn.) *Gen. Pl. p.* 547.—Calyx turbinato-campanulate, acute at the base, often incurved 5-toothed sub-bilabiate. Corol papilionaceous vexillum orbicular or broadly ovate ; wings obliquely obovate or oblong, keel petals distinct or slightly cohering, stamens 10 all connate into one sheath or equally diadelphous 5-5 or unequally diadelphous 9-1, anthers versatile, ovary stalked or sessile 2-6 ovuled, style filiform slightly incurved, stigma small terminal, legume compressed indehiscent orbicular or ovate more or less oblique or falcate, style lateral or rarely terminal, surrounded by a wing, woody and often rugose in the middle where the seed is lodged, seeds 1-2 separated by hard partitions oblong or subreniform radicle short incurved; unarmed trees, leaves alternate unequally pinnated, leaflets alternate or irregularly opposite exstipulate, flowers yellow in axillary or terminal racemes or panicles

PTEROCARPUS MARSUPIUM. (Roxb.) A large tree, trunk erect very high, but not often straight; bark outer-coat brown, spongy, falling off in flakes, inwardly red, fibrous, and astringent, branches spreading horizontal, numerous, leaves alternate unequally pinnate 8-9 inches long, leaflets 5-7 alternate elliptic to oblong or obovate emarginate firm, above shining and deep-green 3-5 inches long by 2-3 broad, racemes simple or panicled axillary or terminal, flowers yellow, stamens 10 monadelphous or at length splitting into equal divisions of 5-5 each (isadelphous) legume stipitate obliquely orbicular, surrounded by a waved veined membranaceous wing, style lateral. *Roxb. Fl. Ind.* iii. 234;—*W. A. Prod.* 266.

Next to teak and blackwood, our most valuable timber tree, abundant throughout the Madras Presidency and in Mysore, Bengal, Bombay and Ceylon. Its size and manner of growth differ very much under different circumstances: it is often very poor and scraggy, but attains a fine size in our western forests and in favorable ravines, and subalpine jungles elsewhere; it is seldom found "of any size" above 4,000 feet elevation, and is generally in flower in July, but I have seen it in flower at other seasons. It is most generally known by its Tamil name Vengay, and is called Yeggi in Telugoo, Bengha in South Canara, Hone in Mysore and Coorg, Beejàsà, Peèa Sal or Peet Sál in Bengal, Bibla in Bombay, and Gammalu in Ceylon. The timber is dark colored and strong, and much prized for building purposes, and in some parts of our Presidency fetches as high a price as teak. Mr. Rohde says it is the best timber he knows for exposed venetians and weather boards; it gives out a yellow stain when damp; it is attacked by the Teredo navalis when used for the bottoms of ships, and is apt to warp if sawn green. A reddish gum resin exudes from wounds in the bark, which is known as Kino or Dragon's blood, and is largely exported from Malabar.



Govindoo, del.

Dumphy, lith:

Pterocarpus marsupium (Roxb:)

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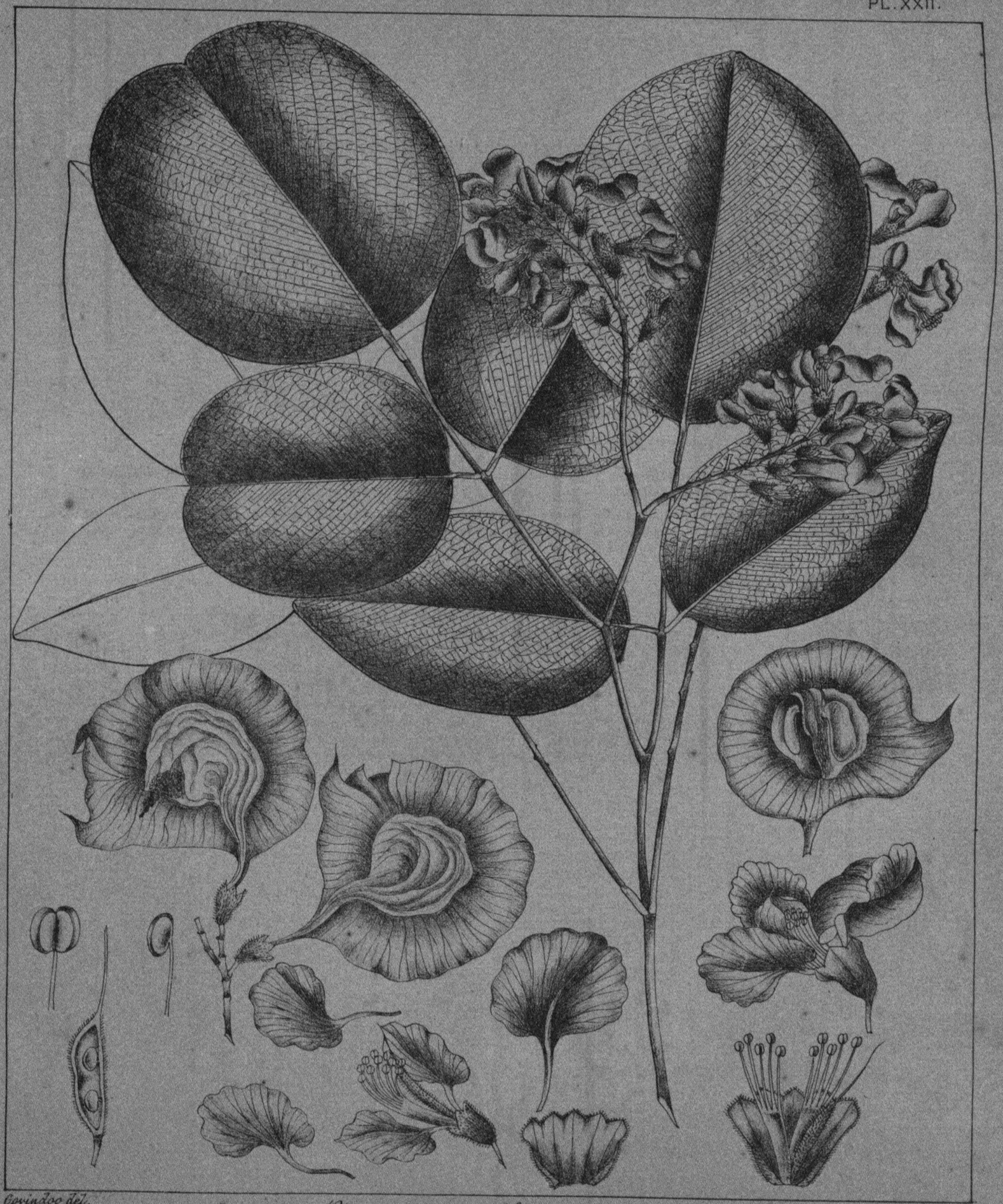
PTEROCARPUS SANTALINUS. (Nat. ord. Leguminosæ.)

For Gen. Char. see under "Pterocarpus marsupium."

PTEROCARPUS SANTALINUS. A small tree, leaves alternate, unequally pinnate 6-8 inches long, leaflets always 3, lower pair alternate or sub-opposite, all broadly ovate to orbicular deeply emarginate or retuse at the apex, sub-cordate or rounded at the base, about 3 inches long by 2½ broad, young parts and under surface of the leaves slightly sericeous, panicles terminal or axillary, calyx slightly puberulous, stamens isadelphous (5-5) legume surrounded by a wing (as in the genus) uniform, style lateral. *Roxb. Fl. Ind.* iii. 234.

This is the famous red sanders tree of commerce; it differs from the (Vengay) Pterocarpus marsupium (which it much resembles in flower and fruit) by always having 3 instead of 5-7 leaflets. It was thus described correctly by Dr. Roxburgh, but subsequent authorities have described it erroneously as having 5-7 leaflets. It is abundant on the low hills about the Cuddapah and North Arcot forests, and the southern part of the Kurnool district, and I have seen a few trees in the Godavery forests. I have never met with it elsewhere in our Presidency, and it is not I believe found anywhere else in India; it is known by the native names of Shandum and Chandam. The wood is of a fine red color and beautifully streaked, very hard and heavy, and takes a fine polish; it is much used and highly prized by the natives for building purposes and for turnery in Madras and the districts in which it grows; it is also largely exported from Madras as a dye wood, and used as ballast; it is a very small tree, not often found over 3½ or 4 feet in girth and about 20 to 25 feet in height, the largest trees reach 4½ feet in girth, but are then much heart shaken or hollow. The largest tree in our plantations is five years old, and is 18 feet 5 inches high, and 9 inches in girth:—a bundy-load of selected logs will sell for as much as 200 Rupees, i. e., twenty logs at 10 Rupees each; the roots and stumps used for dying purposes, sell at 6 to 9 Rupees the 1,000 lbs. The cattle during the dry season are much fed upon the leaves of this tree, and young saplings are often bodily cut down by thousands by the cowherds.



Govindoo, del.

Pterocarpus santalinus (Linn.)

Dumphy, lith.

PTEROCARPUS INDICUS. (Nat. ord. Leguminosæ.)

For Gen. Char. see under "Pterocarpus marsupium."

PTEROCARPUS INDICUS. (Willd.) A tree of considerable size, trunk straight, bark tolerably smooth ash-colored, leaves alternate unequally pinnate 6-15 inches long, leaflets 7-9 (rarely more) ovate acuminate firm and polished on both sides, alternate short petioled from 2 to 4 inches long by 1½ to 2 broad, racemes axillary at the apex of the branchlets and forming a terminal panicle flowers numerous yellow fragrant, stamens 10 monadelphous at length isadelphous (5-5) (the vexillum-stamen rarely free) legume stipitate obliquely suborbicular style lateral, seeds 1-2. *Roxb. Fl. Ind.* iii. 238 ;—*Willd. El. Sp.* iii. 904 ;—Pterocarpus dalbergioides, *Roxb. Fl. Ind.* iii. 236 ;—Pterocarpus Wallichii and P. dalbergioides, *Wight and Arnt. Prod. p.* 267.—(Pterocarpus flavus, *Lour*, and P. obtusatus, *Mig. Fl. Ned. Ind.* i. *p.* 136, both probably belong to this species.)

A very handsome tree, said to be indigenous to Southern India, but I have never met with it wild; it is cultivated in gardens and is well deserving of extended cultivation; it is common in Birmah, where it is called Padowk, and in the Andamans, where it is known as red wood; it is also found in Malacca, Penang, Sumatra, Java, Philippine Islands, and South China. It yields a valuable red-colored beautiful timber, which is much used in the Gun-carriage Manufactories in Madras and Bengal. Dr. Brandis says that the wood is prized above all others in Birmah for cart wheels; the trees are felled green and split up into short planks 3 feet 6 inches long by 2 feet wide and 9 inches thick; three of these pieces make one wheel, and a pair are sold in the forests from 12 to 25 Rs.

The wood is used for furniture, and by the Birmese for musical instruments; it weighs about 60 lbs. the cubic foot.

Govindoo del. Dunphy, Lith.

Pterocarpus Indicus (Willd.)

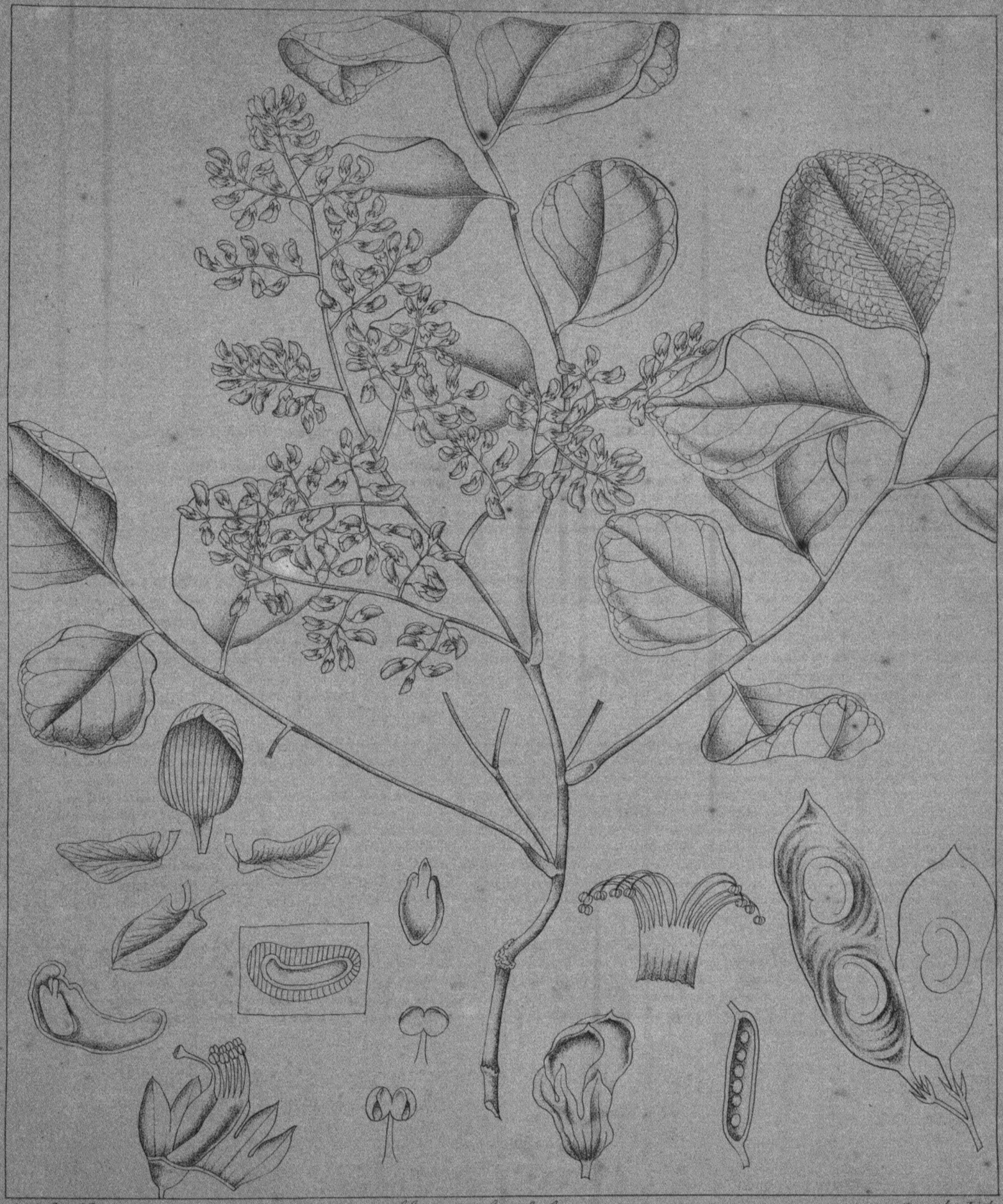
DALBERGIA LATIFOLIA. (Nat. ord. Leguminosæ; Sub-ord. Papilionaceæ; Tribe Dalbergieæ.)

DALBERGIA. (L. f. Suppl. 52.) *Gen. Pl.* 544.—GEN. CHAR. Calyx campanulate 5-toothed, the 2 superior teeth broader, vexillum ovate or orbicular, wings oblong free, keel petals free or connate above, stamens 9-10 all connate into one sheath or the vexillum stamen free 9 and 1 or isadelphous 5-5, anthers small erect didymous, the cells opening at the top or rarely longitudinally, ovary stalked, few ovuled, style incurved small, stigma small terminal, legume oblong or linear thin flat and indehiscent, often wrinkled and thickened about the seed; seeds 1 or rarely 2-4, large thin and flat in the centre of the pod. Trees or woody climbers, leaves alternate pinnate, the leaflets alternate with a terminal odd one (very rarely 1 foliate), flowers small in dichotomous cymes or irregular panicles.

DALBERGIA LATIFOLIA. (Roxb.) A very large timber tree, trunk erect though rarely straight, rising to a great height and of very large girth, branches spreading, very numerous, forming a large shady head, leaves alternate pinnate with an odd one 6-9 inches long, leaflets 3-7 generally 5 alternate, the exterior ones largest and roundish, emarginate, a little waved above, smooth, covered with a little whitish down beneath, at length glabrous, about 2 inches long and the same broad, petioles round smooth ¼ to ½ an inch long, panicles axillary terminal glabrous or minutely hoary, flowers small white on short slender pedicels, calyx segments oblong more or less obtuse, petals unquiculate, stamens 9 monadelphous, style subulate, stigma small, nearly as long as the ovary, ovary stalked, 3-7 ovuled, legume stalked, oblong lanceolate usually 1 seeded. *Roxb. Fl. Ind.* iii. 221, and Dalbergia emarginata, *l. c. p.* 224;—*W. A. Prod. p.* 264.

This is the well-known blackwood or rosewood tree. It is found throughout the Madras Presidency, Mysore, Coorg, Bombay, Central India, and parts of Bengal, Sikkim, and in the Andaman Islands; it grows to a very large size on the mountains, particularly on the western side of our Presidency; and I have measured trees considerably over 20 feet in girth; it is generally known in our western forests by the Tamil name Eetee, and on the eastern side by the Telugoo names Jitegee and Yerugudu, and in Mysore and South Canara by the Canarese names Biti and Thodăgatti, and in Bengal it is called Sit Sāl. It is not found in Ceylon, nor I believe in Birmah. It ascends the mountains to nearly 4,000 feet, and grows equally well in the dry deciduous forests with teak, and in the moist evergreen sholas, and is often associated with bamboo. The timber is one of the most valuable in India, and generally fetches a higher price than teak; it is very heavy, strong, fibrous, close-grained and durable; it differs much in color but is generally purple-black; it admits of a very fine polish, and is our best furniture wood, and extensively used for Gun-carriage purposes. It grows readily from seed but is of very slow growth, particularly when young. The Forest Department have had plantations of it for some years in South Canara and Malabar, but the plants are still very small: self-sown seedlings are generally to be met with about Coffee Estates in our western forests; the tree flowers in March and April.

The Dalbergia sissoides (Graham), common about the forests of the Coimbatore district, Palghat, the Anamallays, Madura and Tinnevelly, is a smaller tree than that of D. latifolia. The wood is generally of a redder color, and the tree flowers in the rainy season (July), instead of the hot weather; it is always distinguished by the Palghat axmen as the Eeruputu, the D. latifolia being called Eetee (Dr. Wight transposes these native names). I cannot however distinguish the two trees botanically; the flowers of the sissoides are said to be rather larger and the leaves narrower, but these differences are not constant, and the same drawing might answer for either tree: I cannot therefore look upon sissoides as more than a variety of latifolia.



Govindoo del. Dumphy Lith.

Dalbergia latifolia (Roxb.)

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OUTLINES OF BOTANY

TO ACCOMPANY THE FLORA SYLVATICA.

From Mr. Bentham's 'Flora Australiensis.'

CHAP. I. DEFINITIONS AND DESCRIPTIVE BOTANY.

1. THE principal object of a **Flora** of a country is to afford the means of *determining* (*i. e.* ascertaining the name of) any plant growing in it, whether for the purpose of ulterior study or of intellectual exercise.

2. With this view, a Flora consists of descriptions of all the wild or native plants contained in the country in question, so drawn up and arranged that the student may identify with the corresponding description any individual specimen which he may gather.

3. These descriptions should be *clear, concise, accurate,* and *characteristic,* so as that each one should be readily adapted to the plant it relates to, and to no other one, they should be as nearly as possible arranged under *natural* (184) divisions, so as to facilitate the comparison of each plant with those nearest allied to it; and they should be accompanied by an *artificial key* or index, by means of which the student may be guided step by step in the observation of such peculiarities or *characters* in his plant, as may lead him, with the least delay, to the individual description belonging to it.

4. For descriptions to be clear and readily intelligible, they should be expressed as much as possible in ordinary well-established language. But, for the purpose of accuracy, it is necessary not only to give a more precise technical meaning to many terms used more or less vaguely in common conversation, but also to introduce purely technical names for such parts of plants or forms as are of little importance except to the botanist. In the present chapter it is proposed to define such *technical* or *technically limited* terms as are made use of in these Floras.

5. At the same time mathematical accuracy must not be expected. The forms and appearances assumed by plants and their parts are infinite. Names cannot be invented for all; those even that have been proposed are too numerous for ordinary memories. Many are derived from supposed resemblances to well known forms or objects. These resemblances are differently appreciated by different persons, and the same term is not only differently applied by two different botanists, but it frequently happens that the same writer is led on different occasions to give somewhat different meanings to the same word. The botanist's endeavours should always be, on the one hand, to make as near an approach to precision as circumstances will allow; and on the other hand, to avoid that prolixity of detail and overloading with technical terms which tends rather to confusion than clearness. In this he will be more or less successful. The aptness of a botanical description, like the beauty of a work of imagination, will always vary with the style and genius of the author.

§ 1. *The Plant in General.*

6. The **Plant**, in its botanical sense, includes every being which has *vegetable life*, from the loftiest tree which adorns our landscapes, to the humblest moss which grows on its stem, to the mould or fungus which attacks our provisions, or the green scum that floats on our ponds.

7. Every portion of a plant which has a distinct part or *function* to perform in the operations or phenomena of vegetable life is called an **Organ.**

8. What constitutes *vegetable life*, and what are the functions of each organ, belong to *Vegetable Physiology*; the microscopical structure of the tissues composing the organs, to *Vegetable Anatomy*; the composition of the substances of which they are formed, to *Vegetable Chemistry*; under *Descriptive and Systematic Botany* we have chiefly to consider the forms of organs, that is, their *Morphology*, in the proper sense of the term, and their general structure, so far as it affects classification and specific resemblances and differences. The terms we shall now define belong chiefly to the latter branch of Botany, as being that which is essential for the investigation of the Flora of a country. We shall add, however, a short chapter on Vegetable Anatomy and Physiology, as a general knowledge of both imparts an additional interest to and facilitates the comparison of the characters and affinities of the plants examined.

9. In the more perfect plants their organs are comprised in the general terms **Root, Stem, Leaves, Flowers,** and **Fruit.** Of these the three first, whose function is to assist in the growth of the plant, are *Organs of Vegetation*; the flower and fruit, whose office is the formation of the seed, are the *Organs of Reproduction.*

10. All these organs exist, in one shape or another, at some period of the life of most, if not all, *flowering plants*, technically called *phænogamous* or *phaneragamous plants*: which all bear some kind of flower and fruit in the botanical sense of the term. In the lower classes, the ferns, mosses, fungi, moulds or mildews, seaweeds, etc., called by botanists *cryptogamous plants*, the flowers, the fruit, and not unfrequently one or more of the organs of vegetation, are either wanting, or replaced by organs so different as to be hardly capable of bearing the same name.

11. The observations comprised in the following pages refer exclusively to the flowering or phænogamous plants. The study of the cryptogamous classes has now become so complicated as to form almost a separate Science. They are therefore not included in these introductory observations, nor with the exception of ferns and their allies, in the present Flora.

12. **Plants** are

Monocarpic, if they die after one flowering-season. These include *Annuals*, which flower in the same year in which they are raised from seed; and *Biennials*, which only flower in the year following that in which they are sown.

Caulocarpic, if, after flowering, the whole or part of the plant lives through the winter and produces fresh flowers another season. These include *Herbaceous perennials*, in which the greater part of the plant dies after flowering, leaving only a smal perennial portion called the Stock or Caudex, close to or within the earth; *Undershrubs, suffruticose suffrutescent* plants, in which the flowering branches, forming a considerable portion of the plant,

die down after flowering, but leave a more or less prominent perennial and woody base; *Shrubs (frutescent* or *fruticose plants)*, in which the perennial woody part forms the greater part of the plant, but branches near the base, and does not much exceed a man's height; and *Trees (arboreous* or *arborescent plants)* when the height is greater and forms a woody *trunk*, scarcely branching from the base. *Bushes* are low, much branched shrubs.

13. The terms *Monocarpic* and *Caulocarpic* are but little used, but the other distinctions enumerated above are universally attended to, although more useful to the gardener than to the botanist, who cannot always assign to them any precise character. Monocarpic plants, which require more than two or three years to produce their flowers, will often, under certain circumstances, become herbaceous perennials, and are generally confounded with them. Truly perennial herbs will often commence flowering the first year, and have then all the appearance of annuals. Many tall shrubs and trees lose annually their flowering branches like undershrubs. And the same botanical species may be an annual or a perennial, a herbaceous perennial or an under shrub, an under shrub or a shrub, a shrub or a tree, according to climate, treatment, or variety.

14. Plants are usually *terrestrial*, that is, growing on earth, or *aquatic*, *i. e.* growing in water; but sometimes they may be found attached by their roots to other plants, in which case they are *epiphytes*; when simply growing upon other plants without penetrating into their tissue, *parasites* when their roots penetrate into and derive more or less nutriment from the plant to which they are attached.

15. The simplest form of the perfect plant, the annual, consists of—

(1) The **Root**, or descending axis, which grows downwards from the stem, divides and spreads in the earth or water, and absorbs food for the plant through the extremities of its branches.

(2) The **Stem**, or ascending axis, which grows upwards from the root, branches and bears first one or more leaves in succession, then one or more flowers, and finally one or more fruits. It contains the tissues or other channels (217) by which the nutriment absorbed by the roots is conveyed in the form of *sap* (192) to the leaves or other points of the surface of the plant, to be *elaborated* or *digested* (218), and afterwards redistributed over different parts of the plant for its support and growth.

(3) The **Leaves**, usually flat, green, and horizontal, are variously arranged on the stem and its branches. They *elaborate* or *digest* (218) the nutriment brought to them through the stem, absorb carbonic acid gas from the air, exhaling the superfluous oxygen, and returning the assimilated sap to the stem.

(4) The **Flowers**, usually placed at or towards the extremities of the branches. They are destined to form the future seed. When perfect and complete they consist: 1st, of a *pistil* in the centre, consisting of one or more *carpels*, each containing the germ of one or more seeds; 2nd, of one or more *stamens* outside the pistil, whose action is necessary to *fertilize* the pistil or enable it to ripen its seed; 3rd, of a *perianth* or *floral envelope*, which usually encloses the stamens and pistil when young, and expands and exposes them to view when fully formed. This complete perianth is double: the outer one, called *Calyx*, is usually more green and leaf like; the inner one called the *Corolla*, more conspicuous, and variously coloured. It is the perianth, and especially the corolla, as the most showy part, that is generally called the flower in popular language.

(5) The **Fruit**, consisting of the pistil or its lower portion, which persists or remains attached to the plant after the remainder of the flower has withered and fallen off. It enlarges and alters more or less in shape or consistence, becomes a *seed-vessel*, enclosing the seed until it is ripe, when it either opens to discharge the seed or falls to the ground with the seed. In popular language the term *fruit* is often limited to such seed-vessels as are or look juicy and eatable. Botanists give that name to all seed-vessels.

16. The herbaceous perennial resembles the annual during the first year of its growth; but it also forms (usually towards the close of the season), on its *stock* (the portion of the stem and root which does not die), one or more *buds*, either exposed, and then popularly called *eyes* or concealed among leaves. These buds, called *leaf-buds*, to distinguish them from *flower-buds* or unopened flowers, are future branches as yet undeveloped; they remain dormant through the winter, and the following spring grow out into new stems bearing leaves and flowers like those of the preceding year, whilst the lower part of the stock emits fresh roots to replace those which had perished at the same time as the stems.

17. Shrubs and trees form similar leaf-buds either at the extremity of their branches, or along the branches of the ear. In the latter case these buds are usually *axillary*, that is, they appear in the *axil* of each leaf, *i. e.* in the angle formed by the leaf and the branch. When they appear at any other part of the plant, they are called *adventitious*. If these buds by producing roots (19) become distinct plants before separating from the parent, or if adventitious leaf-buds are produced in the place of flowers or seeds, the plant is said to be *viviparous* or *proliferous*.

§ 2. *The Root.*

18. **Roots** ordinarily produce neither buds, leaves, nor flowers. Their branches, called *fibres*, when slender and long proceed irregularly from any part of their surface.

19. Although roots proceed usually from the base of the stem or stock, they may also be produced from the base of any bud, especially if the bud lie along the ground, or is otherwise placed by nature or art in circumstances favourable for their development, or indeed occasionally from almost any part of the plant. They are then often distinguished as *adventitious*, and this term is by some applied to all roots which are not in prolongation of the original radicle.

20. **Roots** are

fibrous, when they consist chiefly of slender fibres.

tuberous, when either the main root or its branches are thickened into one or more short fleshy or woody masses called *tubers* (25).

taproots, when the main root descends perpendicularly into the earth, emitting only very small fibrous branches.

21. The stock of a herbaceous perennial, or the lower part of the stem of an annual or perennial, or the lowest branches of a plant, are sometimes underground and assume the appearance of a root. They then take the name of *rhizome*. The rhizome may always be distinguished from the true root by the presence or production of one or more buds, or leaves, or scales.

§ 3. *The Stock.*

22. The **Stock** of a herbaceous perennial, in its most complete state, includes a small portion of the summits of the previous year's roots, as well as of the base of the previous year's stems. Such stocks will increase yearly, so as at length to form dense tufts. They will often preserve through the winter a few leaves, amongst which are placed the buds which grow out into stems the following year, whilst the under side of the stock emits new roots from or amongst the remains of the old ones. These perennial stocks only differ from the permanent base of an undershrub in the shortness of the perennial part of the stems and in the texture usually less woody.

23. In some perennials, however, the stock consists merely of a branch, which proceeds in autumn from the base of the stem either aboveground or underground, and produces one or more buds. This branch, or a portion of it, alone survives the winter. In the following year its buds produce the new stem and roots, whilst the rest of the plant, even the branch on which these buds were formed, has died away. These *annual stocks*, called sometimes

hybernacula, *offsets*, or *stolons*, keep up the communication between the annual stem and root of one year and those of the following year, thus forming altogether a perennial plant.

24. The stock, whether annual or perennial, is often entirely underground or root-like. This is the *rootstock*, to which some botanists limit the meaning of the term *rhizome*. When the stock is entirely root-like, it is popularly called the *crown* of the root.

25. The term *tuber* is applied to a short, thick, more or less succulent rootstock or rhizome, as well as to a root of that shape (20), although some botanists propose to restrict its meaning to the one or to the other. An Orchis tuber, called by some a *knob*, is an annual tuberous rootstock with one bud at the top. A potato is an annual tuberous rootstock with several buds.

26. A *bulb* is a stock of a shape approaching to globular, usually rather conical above and flattened underneath, in which the bud or buds are concealed, or nearly so, under *scales*. These scales are the more or less thickened bases of the decayed leaves of the preceding year, or of the undeveloped leaves of the future year, or of both. Bulbs are annual or perennial, usually underground or close to the ground, but occasionally buds in the axils of the upper leaves become transformed into bulbs. Bulbs are said to be *scaly* when their scales are thick and loosely imbricated, *tunicated* when the scales are thinner, broader, and closely rolled round each other in concentric layers.

27. A *corm* is a tuberous rootstock, usually annual, shaped like a bulb, but in which the bud or buds are not covered by scales, or of which the scales are very thin and membranous.

§ 4. *The Stem.*

28. **Stems** are

erect, when they ascend perpendicularly from the root or stock; *twiggy* or *virgate*, when at the same time they are slender, stiff, and scarcely branched.

sarmentose, when the branches of a woody stem are long and weak, although scarcely climbing.

decumbent or *ascending*, when they spread horizontally, or nearly so, at the base, and then turn upwards and become erect.

procumbent, when they spread along the ground the whole or the greater portion of their length; *diffuse*, when at the same time very much and rather loosely branched.

prostrate, when they lie still closer to the ground.

creeping, when they emit roots at their nodes. This term is also frequently applied to any rhizomes or roots which spread horizontally.

tufted or *cæspitose*, when very short, close, and many together from the same stock.

29. Weak climbing stems are said to *twine*, when they support themselves by winding spirally round any object; such stems are also called *voluble*. When they simply climb without twining, they support themselves by their leaves, or by special clasping organs called *tendrils* (169), or sometimes like the Ivy, by small root-like excrescences.

30. *Suckers* are young plants formed at the end of creeping, underground rootstocks. *Scions*, *runners*, and *stolons*, or *stoles*, are names given to young plants formed at the end or at the nodes (31) of branches or stocks creeping wholly or partially above-ground, or sometimes to the creeping stocks themselves.

31. A *node* is a point of the stem or its branches at which one or more leaves, branches, or leaf-buds (16) are given off. An *internode* is the portion of the stem comprised between two nodes.

32. **Branches** or **leaves** are

opposite, when two proceed from the same node on opposite sides of the stem.

whorled or *verticillate* (in a *whorl* or *verticil*), when several proceed from the same node, arranged regularly round the stem; *geminate*, *ternate*, *fascicled*, or *fasciculate* when two, three, or more proceed from the same node on the same side of the stem. A tuft of fasciculate leaves is usually in fact a leafy branch, so short that the leaves appear to proceed all from the same point.

alternate, when one only proceeds from each node, one on one side and the next above or below, though usually not in the same vertical line.

decussate, when opposite, but each pair placed at right-angles to the next pair above or below it; *distichous*, when regularly arranged one above another in two opposite rows, one on each side of the stem; *tristichous*, when in three rows, etc. (92).

scattered, when irregularly arranged round the stem; frequently, however, botanists apply the term *alternate* to all branches or leaves that are neither opposite nor whorled.

secund, when all start from or are turned to one side of the stem.

33. **Branches** are *dichotomous* when several times forked, the two branches of each fork being nearly equal; *trichotomous*, when there are three nearly equal branches at each division instead of two; but when the middle branch is evidently the principal one, the stem is usually said to have two opposite branches; *umbellate*, when divided in the same manner into several nearly equal branches proceeding from the same point. If however the central branch is larger than the two or more lateral ones, the stem is said to have opposite or whorled branches, as the case may be.

34. A *culm* is a name sometimes given to the stem of Grasses, Sedges, and some other Monocotyledonous plants.

§ 5. *The Leaves.*

35. The ordinary or perfect **Leaf** consists of a flat *blade* or *lamina*, usually green, and more or less horizontal, attached to the stem by a stalk called a *footstalk* or *petiole*. When the form or dimensions of a leaf are spoken of, it is generally the blade that is meant, without the petiole or stalk.

36. The end by which a leaf, a part of the flower, a seed, or any other organ, is attached to the stem or other organ, is called its *base*, the opposite end is its *apex* or summit, excepting sometimes in the case of anther-cells (115.)

37. **Leaves** are

sessile, when the blade rests on the stem without the intervention of a petiole.

amplexicaul or *stem-clasping*, when the sessile base of the blade clasps the stem horizontally.

perfoliate, when the base of the blade not only clasps the stem, but closes round it on the opposite side, so that the stem appears to pierce through the blade.

decurrent, when the edges of the leaf are continued down the stem so as to form raised lines or narrow appendages, *called wings*.

sheathing, when the base of the blade, or of the more or less expanded petiole, forms a vertical sheath round the stem for some distance above the node.

38. Leaves and flowers are called *radical*, when inserted on a rhizome or stock, or so close to the base of the stem as to appear to proceed from the root, rhizome, or stock; *cauline*, when inserted on a distinct stem. Radical leaves are *rosulate* when they spread in a circle on the ground,

39. **Leaves** are

simple and *entire*, when the blade consists of a single piece, with the margin nowhere indented, *simple* being used in opposition to *compound*, *entire* in opposition to *dentate*, *lobed*, or *divided*.

ciliate, when bordered with thick hairs or fine hair-like teeth.

dentate or *toothed*, when the margin is only cut a little way in, into what have been compared to teeth Such leaves are *serrate*, when the teeth are regular and pointed like the teeth of a saw ; *crenate*, when regular and blunt or rounded (compared to the battlement of a tower), *serrulate*, and *crenulate*, when the serratures or crenatures are small, *sinuate*, when the teeth are broad, not deep, and irregular (compared to bays of the coast) ; *wavy* or *undulate*, when the edges are not flat, but bent up and down (compared to the waves of the sea).

lobed or *cleft*, when more deeply indented or divided, but so that the incisions do not reach the midrib or petiole. The portions thus divided take the name of *lobes*. When the lobes are narrow and very irregular, the leaves are said to be *laciniate*. The spaces between the teeth or lobes are called *sinuses*.

divided or *dissected*, when the incisions reach the midrib or petiole, but the parts so divided off, called *segments*, do not separate from the petiole, even when the leaf falls, without tearing.

compound, when divided to the midrib or petiole, and the parts so divided off, called *leaflets*, separate, at least at the fall of the leaf, from the petiole, as the whole leaf does from the stem, without tearing. The common stalk upon which the leaflets are inserted is called the *common petiole* or the *rhachis* ; the separate stalk of each leaflet is a *petiolule*.

40. Leaves are more or less marked by *veins*, which, starting from the stalk, diverge or branch as the blade widens, and spread all over it more or less visibly. The principal ones, when prominent, are often called *ribs* or *nerves*, the smaller branches only then retaining the name of *veins*, or the latter are termed *veinlets*. The smaller veins are often connected together like the meshes of a net, they are then said to *anastomose*, and the leaf is said to be *reticulate* or *net-veined*. When one principal vein runs direct from the stalk towards the summit of the leaf, it is called the *midrib* When several start from the stalk, diverge slightly without branching, and converge again towards the summit, they are said to be *parallel* although not mathematically so. When 3 or 5 or more ribs or nerves diverge *from the base*, the leaf is said to be *3-nerved*, *5-nerved*, etc , but if the lateral ones diverge from the midrib a little above the base, the leaf is *triplinerved*, *quintuplinerved*, etc. The arrangement of the veins of a leaf is called their *venation*.

41. The **Leaflets, Segments, Lobes** or **veins** of leaves are

pinnate (feathered), when there are several succeeding each other on each side of the midrib or petiole, compared to the branches of a feather. A pinnately lobed or divided leaf is called *lyrate* when the terminal lobe or segment is much larger and broader than the lateral ones, compared, by a stretch of imagination, to a lyre ; *runcinate*, when the lateral lobes are curved backwards towards the base of the leaf ; *pectinate*, when the lateral lobes are numerous, narrow, and regular, like the teeth of a comb.

palmate or *digitate*, when several diverge from the same point, compared to the fingers of the hand.

ternate, when three only start from the same point, in which case the distinction between the palmate and pinnate arrangement often ceases or can only be determined by analogy with allied plants. A leaf with ternate lobes is called *trifid*. A leaf with three leaflets is sometimes improperly called a ternate leaf : it is the leaflets that are ternate , the whole leaf is *trifoliolate*. Ternate leaves are leaves growing three together.

pedate, when the division is at first ternate, but the two outer branches are forked, the outer ones of each fork again forked, and so on and all the branches are near together at the base, compared vaguely to the foot of a bird.

42 Leaves with pinnate, palmate, pedate, etc. leaflets, are usually for shortness called *pinnate*, *palmate*, *pedate*, etc. *leaves*. If they are so cut into segments only, they are usually said to be *pinnatisect*, *palmatisect*, *pedatisect*, etc., although the distinction between segments and leaflets is often unheeded in descriptions, and cannot indeed always be ascertained. If the leaves are so cut only into lobes, they are said to be *pinnatifid*, *palmatifid*, *pedatifid*, etc.

43. The teeth, lobes, segments, or leaflets may be again toothed, lobed, divided, or compounded. Some leaves are even three or more times divided or compounded. In the latter case they are termed *decompound*. When twice or thrice pinnate (*bipinnate* or *tripinnate*), each primary or secondary division, with the leaflets it comprises, is called a *pinna*. When the pinna of a leaf or the leaflets of a pinna are in pairs, without an odd terminal pinna or leaflet, the leaf or pinna so divided is said to be *abruptly pinnate* ; if there is an odd terminal pinna or leaflet, the leaf or pinna is *unequally pinnate* (*imparipinnatum*).

44. The number of leaves or their parts is expressed adjectively by the following numerals, derived from the Latin :—

uni-,	bi-,	tri-,	quadri-,	quinque-,	sex-,	septem-,	octo-,	novem-,	decem-,	multi-
1-,	2-,	3 ,	4-,	5-,	6-,	7-,	8-,	9-,	10-,	*many-*

prefixed to a termination, indicating the particular kind of part referred to. Thus—

unidentate, *bidentate*, *multidentate*, mean one toothed, two-toothed, many-toothed, etc.

bifid, *trifid*, *multifid*, mean two-lobed, three lobed, many lobed, etc.

unifoliolate, *bifoliolate*, *multifoliolate*, mean having one leaflet, two leaflets, many leaflets, etc.

unifoliate, *bifoliate*, *multifoliate*, mean having one leaf, two leaves, many leaves, etc.

biternate and *triternate*, mean twice or thrice ternately divided.

unijugate, *bijugate*, *multijugate*, etc. pinnæ or leaflets, mean that they are in one, two, many, etc. pairs (*juga*).

45 **Leaves** or their parts, when **flat**, or any other flat organs in plants, are

linear, when long and narrow, at least four or five times as long as broad, falsely compared to a mathematical line, for a linear leaf has always a perceptible breadth.

lanceolate, when about three or more times as long as broad, broadest below the middle, and tapering towards the summit, compared to the head of a lance

cuneate, when broadest above the middle, and tapering towards the base, compared to a wedge with the point downwards ; when very broadly cuneate and rounded at the top, it is often called *flabelliform* or *fan-shaped*.

spathulate, when the broad part near the top is short, and the narrow tapering part long, compared to a spathula or flat ladle.

ovate, when scarcely twice as long as broad, and rather broader below the middle, compared to the longitudinal section of an egg ; *obovate* is the same form, with the broadest part above the middle.

deltoid, triangular in the form of the Greek letter Δ.

orbicular, *oval* *oblong*, *elliptical*, *rhomboidal*, etc., when compared to the corresponding mathematical figures.

transversely oblong, or *oblate*, when conspicuously broader than long.

falcate, when curved like the blade of a scythe.

46. Intermediate forms between any two of the above are expressed by combining two terms. Thus, a *linear-lanceolate* leaf is long and narrow yet broader below the middle, and tapering to a point; a *linear-oblong* one is scarcely narrow enough to be called linear, yet too narrow to be strictly oblong, and does not conspicuously taper either towards the summit or towards the base.

47. The *apex* or *summit* of a leaf is

acute or *pointed*, when it forms an acute angle or tapers to a point.

obtuse or *blunt*, when it forms a very obtuse angle, or more generally when it is more or less rounded at the top.

acuminate or *cuspidate*, when suddenly narrowed at the top, and then more or less prolonged into an *acumen* or *point*, which may be acute or obtuse, linear or tapering. Some botanists make a slight difference between the *acuminate* and *cuspidate* apex, the acumen being more distinct from the rest of the leaf in the latter case than in the former; but in general the two terms are used in the same sense, some preferring the one and some the other.

truncate, when the end is cut off square.

retuse, when very obtuse or truncate, and slightly indented.

emarginate or *notched*, when more decidedly indented at the end of the midrib; *obcordate*, if at the same time approaching the shape of a heart with its point downwards.

mucronate, when the midrib is produced beyond the apex in the form of a small point.

aristate, when the point is fine like a hair.

48. The base of the leaf is liable to the same variations of form as the apex, but the terms more commonly used are *tapering* or *narrowed* for acute and acuminate, *rounded* for obtuse, and *cordate* for emarginate. In all cases the petiole or point of attachment prevent any such absolute termination at the base as at the apex.

49. A leaf my be *cordate* at the base whatever be its length or breadth, or whatever the shape of the two lateral lobes, called *auricles* (or *little ears*), formed by the indenture or notch, but the term *cordiform* or *heart-shaped* leaf is restricted to an ovate and acute leaf, cordate at the base, with rounded auricles. The word auricles is more particularly used as applied to sessile and stem-clasping leaves.

50. If the auricles are pointed, the leaf is more particularly called *auriculate*; it is moreover said to be *sagittate*, when the points are directed downwards, compared to an arrow-head; *hastate*, when the points diverge horizontally, compared to a halbert.

51. A *reniform* leaf is broader than long, slightly but broadly cordate at the base, with rounded auricles, compared to a kidney.

52. In a *peltate* leaf, the stalk, instead of proceeding from the lower edge of the blade, is attached to the under surface, usually near the lower edge, but sometimes in the very centre of the blade. The peltate leaf has usually several principal nerves radiating from the point of attachment, being, in fact, a cordate leaf, with the auricles united.

53. All these modifications of division and form in the leaf pass so gradually one into the other that it is often difficult to say which term is the most applicable—whether the leaf be toothed or lobed, divided or compound, oblong or lanceolate, obtuse or acute, etc. The choice of the most apt expression will depend on the skill of the describer.

54. **Leaves**, when **solid, Stems, Fruits, Tubers,** and other parts of plants, when not flattened like ordinary leaves, are

setaceous or *capillary*, when very slender like bristles or hairs.

acicular when very slender, but stiff and pointed like needles.

subulate, when rather thicker and firmer like awls.

linear, when at least four times as long as thick; *oblong*, when from about two to about four times as long as thick, the terms having the same sense as when applied to flat surfaces.

ovoid, when egg-shaped, with the broad end downwards, *obovoid* if the broad end is upwards; these terms corresponding to *ovate* and *obovate* shapes in flat surfaces.

globular or *spherical*, when corresponding to *orbicular* in a flat surface. *Round* applies to both.

turbinate, when shaped like a top.

conical, when tapering upwards; *obconical*, when tapering downwards, if in both cases a transverse section shows a circle.

pyramidal, when tapering upwards; *obpyramidal*, when tapering downwards, if in both cases a transverse section shows a triangle or polygon.

fusiform, or spindle-shaped, when tapering at both ends; *cylindrical*, when not tapering at either end, if in both cases the transverse section shows a circle, or sometimes irrespective of the transverse shape.

terete, when the transverse section is not angular; *trigonous*, *triquetrous*, if the transverse section shows a triangle, irrespective in both cases of longitudinal form.

compressed, when more or less flattened laterally; *depressed*, when more or less flattened vertically, or at any rate at the top; *obcompressed*, (in the achenes of *Compositæ*), when flattened from front to back.

articulate or *jointed*, if at any period of their growth (usually when fully formed and approaching their decay, or in the case of fruits when quite ripe) they separate, without tearing into two or more pieces placed end to end. The joints where they separate are called *articulations*, each separate piece an *article*. The name of *joint* is, in common language, given both to the articulation and the article, but more especially to the former. Some modern botanists, however, propose to restrict it to the article, giving the name of *joining* to the articulation.

didymous, when slightly two-lobed, with rounded obtuse lobes.

moniliform, *torulose*, or beaded, when much contracted at regular intervals, but not separating spontaneously into articles.

55. In their consistence **Leaves** or other organs are

fleshy, when thick and soft; *succulent* is generally used in the same sense, but implies the presence of more juice.

coriaceous, when firm and dry, or very tough, of the consistence of leather.

crustaceous, when firm and brittle.

chartaceous, or *papyraceous*, when of the consistence of paper.

membranous, when thin and not stiff.

scarious or *scariose*, when very thin, more or less transparent and not green, yet rather stiff.

56. The terms applied botanically to the consistence of solids are those in general use in common language.

57. The mode in which unexpanded leaves are disposed in the leaf-bud is called their *vernation* or *præfoliation*; it varies considerably, and technical terms have been proposed to express some of its varieties, but it has been hitherto rarely noticed in descriptive botany.

§ 6. *Scales, Bracts, and Stipules.*

58. **Scales** *(Squamæ)* are leaves very much reduced in size, usually sessile, seldom green or capable of performing the respiratory functions of leaves. In other words, they are organs resembling leaves in their position on the plant, but differing in size, colour, texture, and functions. They are

most frequent on the stock of perennial plants, or at the base of annual branches, especially on the buds of future shoots, when they serve apparently to protect the dormant living germ from the rigour of winter. In the latter case they are usually short, broad, close together, and more or less *imbricated*, that is, overlapping each other like the tiles of a roof. It is this arrangement as well as their usual shape that has suggested the name of *scales*, borrowed from the scales of a fish. Imbricated scales, bracts, or leaves, are said to be *squarrose*, when their tips are pointed and very spreading or recurved.

59. Sometimes, however, most or all the leaves of the plant are reduced to small scales, in which case they do not appear to perform any particular function. The name of *scales* is also given to any small broad scale-like appendages or reduced organs, whether in the flower or any other part of the plant.

60. **Bracts** *(Bracteæ)* are the upper leaves of a plant in flower (either all those of the flowering branches, or only one or two immediately under the flower), when different from the stem-leaves in size, shape, colour, or arrangement. They are generally much smaller and more sessile. They often partake of the colour of the flower, although they very frequently also retain the green colour of the leaves. When small they are often called *scales*.

61. *Floral leaves* or *leafy bracts* are generally the lower bracts or the upper leaves at the base of the flowering branches, intermediate in size, shape, or arrangement, between the stem-leaves and the upper bracts.

62. *Bracteoles* are the one or two last bracts under each flower, when they differ materially in size, shape, or arrangement from the other bracts.

63. **Stipules** are leaf-like or scale-like appendages at the base of the leaf-stalk, or on the node of the stem. When present there are generally two, one on each side of the leaf, and they sometimes appear to protect the young leaf before it is developed. They are however exceedingly variable in size and appearance, sometimes exactly like the true leaves, except that they have no buds in their axils, or looking like the leaflets of a compound leaf, sometimes apparently the only leaves of the plant, generally small and narrow, sometimes reduced to minute scales, spots, or scars, sometimes united into one opposite the leaf, or more or less united with, or *adnate* to the petiole, or quite detached from the leaf, and forming a ring or sheath round the stem in the axil of the leaf. In a great number of plants they are entirely wanting.

64. *Stipellæ*, or secondary stipules, are similar organs, sometimes found on compound leaves at the points where the leaflets are inserted.

65. When scales, bracts, or stipules, or almost any part of the plant besides leaves and flowers are stalked, they are said to be *stipitate*, from *stipes*, a *stalk*.

§ 7. *Inflorescence and its Bracts.*

66. The **Inflorescence** of a plant is the arrangement of the flowering branches, and of the flowers upon them. *An Inflorescence* is a flowering branch, or the flowering summit of a plant above the last stem-leaves, with its branches, bracts, and flowers.

67. A single flower, or an inflorescence, is *terminal* when at the summit of a stem or leafy branch, *axillary* when in the axil of a stem-leaf, *leaf-opposed* when opposite to a stem-leaf. The inflorescence of a plant is said to be *terminal* or *determinate* when the main stem and principal branches end in a flower or inflorescence (not in a leaf-bud), *axillary* or *indeterminate* when all the flowers or inflorescences are axillary, the stem or branches ending in leaf-buds.

68. A *Peduncle* is the stalk of a solitary flower, or of an inflorescence; that is to say, the portion of the flowering branch from the last stem-leaf to the flower, or to the first ramification of the inflorescence, or even up to its last ramifications: but the portion extending from the first to the last ramifications or the axis of inflorescence is often distinguished under the name of *rhachis*.

69. A *Scape* or *radical Peduncle* is a leafless peduncle proceeding from the stock, or from near the base of the stem, or apparently from the root itself.

70. *Pedicel* is the last branch of an inflorescence, supporting a single flower.

71. The branches of inflorescence may be, like those of stems, opposite, alternate, etc. (32, 33), but very often their arrangement is different from that of the leafy branches of the same plant.

72. **Inflorescence** is

centrifugal, when the terminal flower opens first, and those on the lateral branches are successively developed.

centripetal, when the lowest flowers open first, and the main stem continues to elongate, developing fresh flowers.

73. Determinate inflorescence is usually centrifugal. Indeterminate inflorescence is always centripetal. Both inflorescences may be combined on one plant, for it often happens that the main branches of an inflorescence are centripetal, whilst the flowers on the lateral branches are centrifugal, or *vice versâ*.

74. An **Inflorescence** is

a *Spike*, or *spicate*, when the flowers are sessile along a simple undivided axis or rhachis.

a *Raceme*, or *racemose*, when the flowers are borne on pedicels along a single undivided axis or rhachis.

a *Panicle*, or *paniculate*, when the axis is divided into branches bearing two or more flowers.

a *Head*, or *capitate*, when several sessile or nearly sessile flowers are collected into a compact head-like cluster. The short, flat, convex or conical axis on which the flowers are seated, is called the *receptacle*, a term also used for the torus of a single flower (135). The very compact flower-heads of *Compositæ* are often termed *compound flowers*.

an *Umbel*, or *umbellate*, when several branches or pedicels appear to start from the same point and are nearly of the same length. It differs from the head, like the raceme from the spike, in that the flowers are not sessile. An umbel is said to be *simple*, when each of its branches or *rays* bears a single flower; *compound*, when each ray bears a *partial umbel* or *umbellule*.

a *Corymb*, or *corymbose*, when the branches and pedicels, although starting from different points, all attain the same level, the lower ones being much longer than the upper. It is a flat-topped or *fastigiate* panicle.

a *Cyme*, or *cymose*, when branched and centrifugal. It is a centrifugal panicle, and is often corymbose. The central flower opens first. The lateral branches successively developed are usually forked or opposite (dichotomous or trichotomous), but sometimes after the first forking the branches are no longer divided, but produce a succession of pedicels on their upper side, forming apparently unilateral centripetal racemes; whereas if attentively examined, it will be found that each pedicel is at first terminal, but becomes lateral by the development of one outer branch only immediately under the pedicel. Such branches, when in bud, are generally rolled back at the top, like the tail of a scorpion, and are thence called *scorpioid*.

a *Thyrsus*, or *thyrsoid*, when cymes, usually opposite, are arranged in a narrow pyramidal panicle.

75. There are numerous cases where inflorescences are intermediate between some two of the above, and are called by different botanists by one or the other name, according as they are guided by apparent or by theoretical similarity. A spike-like panicle, where the axis is divided into very short branches forming a cylindrical compact inflorescence, is called sometimes a spike, sometimes a panicle. If the flowers are in distinct clusters along a simple axis, the inflorescence is described as an *interrupted* spike or raceme, according as the flowers are nearly sessile or distinctly pedicellate; although when closely examined the flowers will be found to be inserted not on the main axis, but on a very short branch, thus, strictly speaking, constituting a panicle.

76. The *catkins* (*amenta*) of *Amentaceæ*, the *spadices* of several Monocotyledons, the *ears* and *spikelets* of Grasses are forms of the spike.

77. **Bracts** are generally placed singly under each branch of the inflorescence, and under each pedicel; bracteoles are usually two, one on each side, on the pedicel or close under the flower, or even upon the calyx itself; but bracts are also frequently scattered along the branches without axillary pedicels; and when the differences between the bracts and bracteoles are trifling or immateral, they are usually all called bracts.

78. When these bracts appear to proceed from the same point, they will, on examination, be found to be really either one bract and two stipules, or one bract with two bracteoles in its axil. When two bracts appear to proceed from the same point, they will usually be found to be the stipules of an undeveloped bract, unless the branches of the inflorescence are opposite, when the bracts will of course be opposite also.

79. When several bracts are collected in a whorl, or are so close together as to appear whorled, or are closely imbricated round the base of a head or umbel, they are collectively called an *Involucre*. The bracts composing an involucre are described under the names of *leaves*, *leaflets*, *bracts*, or *scales*, according to their appearance, *Phyllaries* is a useless term, lately introduced for the bracts or scales of the involucre of *Compositæ*. An Involucel is the involucre of a partial umbel.

80. When several very small bracts are placed round the base of a calyx or of an involucre, they have been termed a *calycule*, and the calyx or involucre said to be *calyculate*, but these terms are now falling into disuse, as conveying a false impression. When the bracts are whorled and inserted upon the calyx, they form what is frequently called an *epicalyx*.

81. A *Spatha* is a bract or floral leaf enclosing the inflorescence of some Monocotyledons.

82. *Paleæ*, *pales*, or *Chaff*, are the inner bracts or scales in *Compositæ*, *Gramineæ*, and some other plants, when of a thin yet stiff consistence, usually narrow and of a pale colour.

83. *Glumes* are the bracts enclosing the flowers of *Cyperaceæ* and *Gramineæ*.

§ 8. *The Flower in General.*

84. A *complete* **Flower** (15) is one in which the calyx, corolla, stamens, and pistil are all present; a *perfect* flower, one in which all these organs, or such of them as are present, are capable of performing their several functions. Therefore, properly speaking, an *incomplete* flower is one in which any one or more of these organs is wanting; and an *imperfect* flower one in which any one or more of these organs is so altered as to be incapable of properly performing its functions. These imperfect organs are said to be *abortive* if much reduced in size or efficiency, *rudimentary* if so much so as to be scarcely perceptible. But in many works, the term *incomplete* is specially applied to those flowers in which the perianth is simple or wanting, and *imperfect* to those in which either the stamens or pistil are imperfect or wanting.

85. A **Flower** is

dichlamydeous, when the perianth is double, both calyx and corolla being present and distinct.

monochlamydeous, when the perianth is single, whether by the union of the calyx and corolla, or the deficiency of either.

asepalous, when there is no calyx.

apetalous, when there is no corolla.

naked or *achlamydeous*, when there is no perianth at all.

hermaphrodite or *bisexual*, when both stamens and pistil are present and perfect.

male or *staminate*, when there are one or more stamens, but either no pistil at all or an imperfect one.

female or *pistillate*, when there is a pistil, but either no stamens at all, or only imperfect ones.

neuter, when both stamens and pistil are imperfect or wanting.

barren or *sterile*, when from any cause it produces no seed.

fertile, when it does produce seed. In some works the terms *barren*, *fertile*, and *perfect* are also used respectively as synonyms of *male*, *female*, and *hermaphrodite*.

86. The flowers of a plant or species are said collectively to be *unisexual* or *diclinous* when the flowers are all either male or female.

monœcious, when the male and female flowers are distinct, but on the same plant.

diœcious, when the male and female flowers are on distinct plants.

polygamous, when there are male, female, and hermaphrodite flowers on the same or on distinct plants.

87. A head of flowers is *heterogamous* when male, female, hermaphrodite, and neuter flowers, or any two or three of them, are included in one head; *homogamous*, when all the flowers included in one head are alike in this respect. A spike or head of flowers is *androgynous* when male and female flowers are mixed in it. These terms are only used in the case of very few Natural Orders.

88. As the scales of buds are leaves undeveloped or reduced in size and altered in shape and consistence, and bracts are leaves likewise reduced in size, and occasionally altered in colour; so the parts of the flower are considered as leaves still further altered in shape, colour, and arrangement round the axis, and often more or less combined with each other. The details of this theory constitute the comparatively modern branch of botany called *Vegetable Metamorphosis* or *Homology*, sometimes improperly termed *Morphology* (8).

89. To understand the arrangement of the floral parts, let us take a *complete* flower, in which moreover all the parts are *free* from each other, *definite* in number, *i.e.*, always the same in the same species, and *symmetrical* or *isomerous*, *i.e.* when each whorl consists of the same number of parts.

90. Such a complete symmetrical flower consists usually of either four or five whorls of altered leaves (88), placed immediately one within the other.

The **Calyx** forms the outer whorl. Its parts are called *sepals*.

The **Corolla** forms the next whorl. Its parts, called *petals*, usually *alternate* with the sepals; that is to say, the centre of each petal is immediately over or within the interval between two sepals.

The **Stamens** form one or two whorls within the petals. If two, those of the outer whorl (the *outer stamens*) alternate with the petals, and are consequently opposite to, or over the centre of the sepals; those of the inner whorl (the *inner stamens*) alternate with the outer ones, and are therefore opposite to the petal. If there is only one whorl of stamens, they most frequently alternate with the petals; but sometimes they are opposite the petals and alternate with the sepals.

The **Pistil** forms the inner whorl; its carpels usually alternate with the inner row of stamens.

91. In an axillary or lateral flower the *upper* parts of each whorl (sepals, petals, stamens, or carpels) are those which are next to the main axis of the stems or branch, the *lower* parts those which are furthest from it; the intermediate ones are said to be *lateral*. The words *anterior* (front) and *posterior* (back) are often used for lower and upper respectively, but their meaning is sometimes reversed if the writer supposes himself in the centre of the flower instead of outside of it.

92. The number of parts in each whorl of a flower is expressed adjectively by the following numerals derived from the Greek :—

mono-,	di-,	tri-,	tetra-,	penta-,	hexa-,	hepta-,	octo-,	ennea-,	deca-,	etc-,	poly-
1-,	2-,	3-,	4-,	5-,	6-,	7-,	8-,	9-,	10-,		*many-*

prefixed to a termination indicating the whorl referred to.

92. Thus, a **Flower** is

disepalous, trisepalous, tetrasepalous, polysepalous, etc., according as there are 2, 3, 4, or many (or an indefinite number of) sepals.

dipetalous, tripetalous, polypetalous, etc., according as there are 2, 3, or many petals.

diandrous, triandrous, polyandrous, etc., according as there are 2, 3, or many stamens.

digynous, trigynous, polygynous, etc., according as there 2, 3, or many carpels.

And generally (if symmetrical), *dimerous, trimerous, polymerous*, etc., according as there are 2, 3, or many (or an indefinite number of) parts to each whorl.

94. Flowers are *unsymmetrical* or *anisomerous*, strictly speaking, when any one of the whorls has a different number of parts from any other; but when the carpels alone are reduced in number the flower is still frequently called symmetrical or isomerous, if the calyx, corolla, and staminal whorl have all the same number of parts.

95. Flowers are *irregular* when the parts of any one of the whorls are unequal in size, dissimilar in shape, or do not spread regularly round the axis at equal distances. It is however more especially irregularity of the corolla that is referred to in descriptions. A slight inequality in size or direction in the other whorls does not prevent the flower being classed as *regular*, if the corolla or perianth is conspicuous and regular.

§ 9. *The Calyx and Corolla, or Perianth.*

96. The **Calyx** (90) is usually green, and smaller than the corolla; sometimes very minute, rudimentary, or wanting, sometimes very indistinctly whorled, or not whorled at all, or in two whorls, or composed of a large number of sepals of which the outer ones pass gradually into bracts, and the inner ones into petals.

97. The **Corolla** (90) is usually coloured, and of a more delicate texture than the calyx, and, in popular language, is often more specially meant by the *flower*. Its petals are more rarely in two whorls, or indefinite in number, and the whorl more rarely broken than in the case of the calyx, at least when the plant is in a natural state. *Double flowers* are in most cases an accidental deformity or monster in which the ordinary number of petals is multiplied by the conversion of stamens, sepals, or even carpels into petals, by the division of ordinary petals or simply by the addition of supernumerary ones. Petals are also sometimes very small, rudimentary, or entirely deficient.

98. In very many cases, a so-called *simple perianth* (15) (of which the parts are usually called *leaves or segments*) is one in which the sepals and petals are similar in form and texture, and present apparently a single whorl. But if examined in the young bud, one half of the parts will generally be found to be placed outside the other half, and there will frequently be some slight difference in texture, size, and colour, indicating to the close observer the presence of both calyx and corolla. Hence much discrepancy in descriptive works. Where one botanist describes a simple perianth of six segments, another will speak of a double perianth of three sepals and three petals.

99. The following terms and prefixes, expressive of the modifications of form and arrangement of the corolla and its petals, are equally applicable to the calyx and its sepals, and to the simple perianth and its segments.

100. The Corolla is said to be *monopetalous* when the petals are united, either entirely or at the base only, into a cup, tube, or ring; *polypetalous* when they are all free from the base. These expressions, established by a long usage, are not strictly correct, for *monopetalous* (consisting of a single petal) should apply rather to a corolla really reduced to a single petal, which would then be on one side of the axis; and *polypetalous* is sometimes used more appropriately for a corolla with an indefinite number of petals. Some modern botanists have therefore proposed the term *gamopetalous* for the corolla with united petals, and *dialypetalous* for that with free petals; but the old established expressions are still the most generally used.

101. When the petals are partially united, the lower entire portion of the corolla is called the *tube* whatever be its shape, and the free portions of the petals are called the *teeth, lobes*, or *segments* (39), according as they are short or long in proportion to the whole length of the corolla. When the tube is excessively short, the petals appear at first sight free, but their slight union at the base must be carefully attended to, being of importance in classification.

102. The **Æstivation** of a corolla is the arrangement of the petals or of such portion of them as is free, in the unexpanded bud. It is

valvate, when they are strictly whorled in their whole length, their edges being placed against each other without overlapping. If the edges are much inflexed, the æstivation is at the same time *induplicate; involute*, if the margins are rolled inward; *reduplicate*, if the margins project outwards into salient angles; *revolute*, if the margins are rolled outwards; *plicate*, if the petals are folded in longitudinal plaits.

imbricate, when the whorl is more or less broken by some of the petals being outside the others, or by their overlapping each other at least at the top. Five-petaled imbricate corollas are quincuncially imbricate when one petal is outside, and an adjoining one wholly inside, the three others intermediate and overlapping on one side; bilabiate, when two adjoining ones are inside or outside the three others. Imbricate petals are described as *crumpled* (*corrugate*) when puckered irregularly in the bud.

twisted, contorted, or *convolute*, when each petal overlaps an adjoining one on one side, and is overlapped by the other adjoining one on the other side. Some botanists include the twisted æstivation in the general term *imbricate*; others carefully distinguish the one from the other.

103. In a few cases the overlapping is so slight that the three æstivations cannot easily be distinguished one from the other; in a few others the æstivation is variable, even in the same species, but, in general, it supplies a constant character in species, in genera, or even in Natural Orders.

104. In general shape the **Corolla** is

tubular, when the whole or the greater part of it is in the form of a tube or cylinder.

campanulate, when approaching in some measure the shape of a cup or bell.

urceolate, when the tube is swollen or nearly globular, contracted at the top, and slightly expanded again in a narrow rim.

rotate or *stellate*, when the petals or lobes are spread out horizontally from the base, or nearly so, like a wheel or star.

hypocrateriform or *salver-shaped*, when the lower part is cylindrical and the upper portion expanded horizontally. In this case the name of *tube* is restricted to the cylindrical part, and the horizontal portion is called the *limb*, whether it be divided to the base or not. The orifice of the tube is called its *mouth* or *throat*.

infundibuliform or *funnel-shaped*, when the tube is cylindrical at the base, but enlarged at the top into a more or less campanulate limb, of which the lobes often spread horizontally. In this case the campanulate part, up to the commencement of the lobes, is sometimes considered as a portion of the tube, sometimes as a portion of the limb, and by some botanists again described as independent of either, under the name of *throat* (*fauces*). Generally speaking, however, in campanulate, infundibuliform, or other corollas, where the lower entire part passes gradually into the upper divided and more

spreading part, the distinction between the *tube* and the *limb* is drawn either at the point where the lobes separate, or at the part where the corolla first expands, according to which is the most marked.

105 Irregular corollas have received various names according to the more familiar forms they have been compared to. Some of the most important are the

bilabiate, or *two-lipped* corolla, when, in a four-or-five-lobed corolla, the two or three upper lobes stand obviously apart, like an *upper lip*, from the two or three lower ones or *under lip*. In *Orchideæ* and some other families the name of lip, or *labellum*, is given to one of the divisions or lobes of the perianth.

personate, when two-lipped, and the orifice of the tube closed by a projection from the base of the upper or lower lip, called a *palate*.

ringent, when very widely two lipped, and the orifice of the tube very open.

spurred, when the tube or the lower part of a petal has a conical hollow projection, compared to the spur of a cock; *saccate*, when the spur is short and round like a little bag, *gibbous*, when projecting at any part into a slight swelling; *foveolate*, when marked in any part with a slight glandular or thickened cavity.

resupinate or *reversed*, when a lip, spur, etc, which in allied species is usually lowest, lies uppermost, and *vice versâ*.

106. The above terms are mostly applied to the forms of monopetalous corollas, but several are also applicable to those of polypetalous ones. Terms descriptive of the special forms of corolla in certain Natural Orders, will be explained under those Orders respectively.

107. Most of the terms used for describing the forms of leaves (39, 45) are also applicable to those of individual petals, but the flat expanded portion of a petal, corresponding to the blade of the leaf, is called its *lamina*, and the stalk, corresponding to the petiole, its *claw* (*unguis*). The stalked petal is said to be *unguiculate*.

§ 10. *The Stamens.*

108. Although in a few cases the outer stamens may gradually pass into petals, yet, in general, **Stamens** are very different in shape and aspect from leaves, sepals or petals It is only in a theoretical point of view (not the less important in the study of the physiological economy of the plant) that they can be called altered leaves.

109. This usual form is a stalk, called the *filament*, bearing at the top an *anther* divided into two pouches or *cells*. These anther-cells are filled with *pollen*, consisting of minute grains, usually forming a yellow dust, which, when the flower expands, is scattered from an opening in each cell. When the two cells are not closely contiguous, the portion of the anther that unites them is called the *connectivum*.

110. The filament is often wanting, and the anther sessile, yet still the stamen is perfect; but if the anther, which is the essential part of the stamens, is wanting, or does not contain pollen, the stamen is imperfect, and is then said to be *barren* or *sterile* (without pollen), *abortive*, or *rudimentary* (84), according to the degree to which the imperfection is carried. Imperfect stamens are often called *staminodia*.

111. In unsymmetrical flowers, the stamens of each whorl are sometimes reduced in number below that of the petals, even to a single one, and in several Natural Orders they are multiplied indefinitely.

112. The terms *monandrous* and *polyandrous* are restricted to flowers which have really but one stamen, or an indefinite number respectively. Where several stamens are united into one, the flower is said to be *synandrous*.

113. **Stamens** are

monadelphous, when united by their filaments into one cluster. This cluster either forms a tube round the pistil, or, if the pistil is wanting, occupies the centre of the flowers

diadelphous, when so united into two clusters or *phalanges* The term is more especially applied to certain *Leguminosæ*, in which nine stamens are united in a tube slit open on the upper side, and a tenth, placed in a slit, is free. In some other plants the stamens are equally distributed in the two clusters.

triadelphous, *pentadelphous*, *polyadelphous*, when so united into three, five, or many clusters or *phalanges*.

syngenesious, when united by their anthers in a ring round the pistil, the filaments usually remaining free.

didynamous, when (usually in a bilabiate-flower) there are four stamens in two pairs, those of one pair longer than those of the other.

tetradynamous, when (in Cruciferæ) there are six, four of them longer than the two others.

exserted, when longer than the corolla, or even when longer than its tube, if the limb be very spreading.

114 An **Anther** (109) is

adnate, when continuous with the filament, the anther-cells appearing to lie their whole length along the upper part of the filament.

innate, when firmly attached by their base to the filament. This is an adnate anther when rather more distinct from the filament.

versatile, when attached by their back to the very point of the filament, so as to swing loosely.

115. Anther cells may be *parallel* or *diverging* at a less or greater angle, or *divaricate*, when placed end to end so as to form one straight line. The end of each anther cell placed nearest to the other cell is generally called its *apex* or *summit*, and the other end its *base* (36), but some botanists reverse the sense of these terms.

116. Anthers have often, on their connectivum or cells, appendages termed *bristles* (setæ) *spurs*, *crests*, *points*, *glands*, etc., according to their appearance.

117. Anthers have occasionally only one cell. this may take place either by the disappearance of the partition between two closely contiguous cells, when these cells are said to be *confluent*, or by the abortion or total deficiency of one of the cells, when the anther is said to be *dimidiate*.

118. Anthers will open or *dehisce* to let out the pollen, like capsules, in *valves*, *pores*, or *slits* Their dehiscence is *introrse*, when the opening faces the pistil, *extrorse*, when towards the circumference of the flower.

119 Pollen (109) is not always in the form of dust. It is sometimes collected in each cell into one or two little wax-like masses. Special terms used in describing these masses or other modifications of the pollen will be explained under the Orders where they occur

§ 11 *The Pistil*

120. The carpels (91) of the **Pistil**, although they may occasionally assume, rather more than stamens, the appearance and colour of leaves, are still more different in shape and structure. They are usually sessile, if stalked, their stalk is called a *podocarp* This stalk, upon which each separate carpel is supported above the receptacle, must not be confounded with the *gynobasis* (143), upon which the whole pistil is sometimes raised.

121. Each carpel consists of three parts:

1 the **Ovary**, or enlarged base, which includes one or more cavities or *cells*, containing one or more small bodies called *ovules* These are the earliest condition of the future seeds.

2 the **Style**, proceeding from the summit of the ovary, and supporting—

3 the **Stigma**, which is sometimes a point (or *punctiform* stigma) or small head (a *capitate* stigma) at the top of the style or ovary, sometimes a portion of its surface more or less lateral and variously shaped, distinguished by a looser texture, and covered with minute protuberances called *papillæ*.

122. The style is often wanting, and the stigma is then sessile on the ovary, but in the perfect pistil there is always at least one ovule in the ovary, and some portion of stigmatic surface. Without these the pistil is imperfect, and said to be *barren* (not setting seed), *abortive*, or *rudimentary* (84) according to the degree of imperfection.

123. The ovary being the essential part of the pistil, most of the terms relating to the number, arrangement, etc. of the carpels, apply specially to their ovaries. In some works each separate carpel is called a pistil, all those of a flower constituting together the *gynœcium*; but this term is in little use, and the word *pistil* is more generally applied in a collective sense. When the ovaries are at all united, they are commonly termed collectively a compound ovary.

124. The number of carpels or ovaries in a flower is frequently reduced below that of the parts of the other floral whorls, even in flowers otherwise symmetrical. In a very few genera, however, the ovaries are more numerous than the petals, or indefinite. They are in that case either arranged in a single whorl, or form a head or spike in the centre of the flower.

125. The terms *monogynous*, *digynous*, *polygynous*, etc. (with a pistil of one, two, or more parts), are vaguely used, applying sometimes to the whole pistil, sometimes to the ovaries alone, or to the styles or stigmas only. Where a more precise nomenclature is adopted, the flower is

monocarpellary, when the pistil consists of a single simple carpel.

bi-tri-, etc., to *poly-carpellary*, when the pistil consists of two, three, or an indefinite number of carpels, whether separate or united.

syncarpous, when the carpels or their ovaries are more or less united into one compound ovary.

apocarpous, when the carpels or ovaries are all free and distinct.

126. A *compound* ovary is

unilocular or *one-celled*, when there are no partitions between the ovules, or when these partitions do not meet in the centre so as to divide the cavity into several cells.

plurilocular or *several-celled*, when completely divided into two or more cells by partitions called *dissepiments* (*septa*), usually vertical and radiating from the centre or axis of the ovary to its circumference.

bi, *tri*, etc., to *multi-locular*, according to the number of these cells, two, three, etc., or many.

127. In general the number of cells or of dissepiments, complete or partial, or of rows of ovules, corresponds with that of the carpels, of which the pistil is composed. But sometimes each carpel is divided completely or partially into two cells, or has two rows of ovules, so that the number of carpels appears double what it really is. Sometimes again the carpels are so completely combined and reduced as to form a single cell, with a single ovule, although it really consists of several carpels. But in these cases the ovary is usually described as it appears, as well as such as it is theoretically supposed to be.

128. In apocarpous pistils the styles are usually free, each bearing its own stigma. Very rarely the greater part of the styles, or the stigmas alone, are united, whilst the ovaries remain distinct.

129. Syncarpous pistils are said to have

several styles, when the styles are free from the base.

one style, with several branches, when the styles are connected at the base, but separate below the point where the stigmas or stigmatic surfaces commence.

one simple style, with several stigmas, when united up to the point where the stigmas or stigmatic surfaces commence, and then separating.

one simple style, with a branched, lobed, toothed, notched, or entire stigma (as the case may be), when the stigmas also are more or less united. In many works, however, this precise nomenclature is not strictly adhered to, and considerable confusion is often the result.

130. In general the number of styles, or branches of the style or stigma, is the same as that of the carpels, but sometimes that number is doubled, especially in the stigmas, and sometimes the stigmas are dichotomously or pinnately branched, or *penicillate*, that is, divided into a tuft of hair-like branches. All these variations sometimes make it a difficult task to determine the number of carpels forming a compound ovary, but the point is of considerable importance in fixing the affinities of plants, and, by careful consideration, the real as well as the apparent number has now in most cases been agreed upon.

131. The *placenta* is the part of the inside of the ovary to which the ovules are attached, sometimes a mere point or line on the inner surface, often more or less thickened or raised. Placentation is therefore the indication of the part of the ovary to which the ovules are attached.

132. Placentas are

axile, when the ovules are attached to the axis or centre, that is in plurilocular ovaries, when they are attached to the inner angle of each cell; in unilocular simple ovaries, which have almost always an excentrical style or stigma, when the ovules are attached to the side of the ovary nearest to the style; in unilocular compound ovaries, when the ovules are attached to a central protuberance, column, or axis rising up from the base of the cavity. If this column does not reach the top of the cavity, the placenta is said to be *free* and *central*.

parietal, when the ovules are attached to the inner surface of the cavity of a one-celled compound ovary. Parietal placentas are usually slightly thickened or raised lines, sometimes broad surfaces nearly covering the inner surface of the cavity, sometimes projecting far into the cavity, and constituting partial dissepiments, or even meeting in the centre, but without cohering there. In the latter case the distinction between the one-celled and the several-celled ovary sometimes almost disappears.

133. Each **Ovule** (121), when fully formed, usually consists of a central mass or *nucleus* enclosed in two bag-like *coats*, the outer one called *primine*, the inner one *secundine*. The *chalaza* is the point of the ovule at which the base of the nucleus is confluent with the coats. The *foramen* is a minute aperture in the coats over the *apex* of the nucleus.

134. **Ovules** are

orthotropous or *straight*, when the chalaza coincides with the base (36) of the ovule, and the foramen is at the opposite extremity, the axis of the ovule being straight.

campylotropous or *incurved*, when the chalaza still coinciding with the base of the ovule, the axis of the ovule is curved, bringing the foramen down more or less towards that base.

anatropous or *inverted*, when the chalaza is at the apex of the ovule, and the foramen next to its base, the axis remaining straight. In this, one of the most frequent forms of the ovule, the chalaza is connected with the base by a cord, called the *rhaphe*, adhering to one side of the ovule, and becoming more or less incorporated with its coats, as the ovule enlarges into a seed.

amphitropous or *half-inverted*, when the ovule being as it were attached laterally, the chalaza and foramen at opposite ends of its straight or curved axis are about equally distant from the base or point of attachment.

§ 12. *The Receptacle and Relative Attachment of the Floral Whorls.*

135. The **Receptacle** or *torus* is the extremity of the peduncle (above the calyx), upon which the corolla, stamens, and ovary are inserted. It is sometimes little more than a mere point or minute hemisphere, but it is often also more or less elongated, thickened, or otherwise enlarged. It must not be confounded with the receptacle of inflorescence (74).

136. A *Disk* or *disc*, is a circular enlargement of the receptacle, usually in the form of a cup (*cupular*) of a flat disk or quoit, or of a cushion (*pulvinate*). It is either immediately at the base of the ovary within the stamens, or between the petals and stamens, or bears the petals or stamens or both on its margin, or is quite at the extremity of the receptacle, with the ovaries arranged in a ring round it or under it.

137. The disk may be *entire*, or *toothed* or *lobed*, or *divided* into a number of parts, usually equal to or twice that of the stamens or carpels. When the parts of the disk are quite separate and short, they are often called *glands*.

138. *Nectaries* are either the disk, or small deformed petals, or abortive stamens, or appendages at the base of petals, or stamens, or any small bodies within the flower which do not look like petals, stamens, or ovaries. They were formerly supposed to supply bees with their honey, and the term is frequently to be met with in the older Floras, but is now deservedly going out of use.

139. When the disk bears the petals and stamens, it is frequently adherent to, and apparently forms part of, the tube of the calyx, or it is adherent to, and apparently forms part of, the ovary, or of both calyx-tube and ovary. Hence the three following important distinctions in the relative insertion of the floral whorls.

140. *Petals*, or as it is frequently expressed, flowers, are

hypogynous (*i. e.* under the ovary), when they or the disk that bears them are entirely free both from the calyx and ovary. The ovary is then described as *free* or *superior*, the calyx as *free* or *inferior*, the petals as being *inserted on the receptacle*.

perigynous (*i. e.* round the ovary), when the disk bearing the petals is quite free from the ovary, but is more or less combined with the base of the calyx tube The ovary is then still described as *free* or *superior*, even though the combined disk and calyx-tube may form a deep cup with the ovary lying in the bottom; the calyx is said to be *free* or *inferior*, and the petals are described as *inserted on the calyx*.

epigynous (*i. e.* upon the ovary), when the disk bearing the petals is combined both with the base of the calyx-tube and the base outside of the ovary; either closing over the ovary so as only to leave a passage for the style, or leaving more or less of the top of the ovary free, but always adhering to it above the level of the insertion of the lowest ovule (except in a very few cases where the ovules are absolutely suspended from the top of the cell). In epigynous flowers the ovary is described as *adherent* or *inferior*, the calyx as *adherent* or *superior*, the petals as *inserted on* or *above the ovary*. In some works, however, most epigynous flowers are included in the perigynous ones, and a very different meaning is given to the term *epigynous* (144), and there are a few cases where no positive distinction can be drawn between the epigynous and perigynous flowers, or again between the perigynous and hypogynous flowers.

141. When there are no petals, it is the insertion of the stamens that determines the difference between the hypogynous, perigynous, and epigynous flowers.

142. When there are both petals and stamens

in hypogynous flowers, the petals and stamens are usually free from each other, but sometimes they are combined at the base. In that case, if the petals are distinct from each other, and the stamens are monadelphous, the petals are often said to be *inserted on* or *combined with the staminal tube*, if the corolla is gamopetalous and the stamens distinct from each other, the latter are said to be *inserted in the tube of the corolla*.

in perigynous flowers, the stamens are usually inserted immediately within the petals, or alternating with them on the edge of the disk, but occasionally much lower down within the disk, or even on the unenlarged part of the receptacle.

in epigynous flowers, when the petals are distinct, the stamens are usually inserted as in perigynous flowers; when the corolla is gamopetalous, the stamens are either free and epigynous, or combined at the base with (inserted in) the tube of the corolla.

143. When the receptacle is distinctly elongated below the ovary, it is often called a *gynobasis*, *gynophore*, or *stalk of the ovary*. If the elongation takes place below the stamens or below the petals, these stamens or petals are then said to be *inserted on the stalk of the ovary*, and are occasionally, but falsely, described as *epigynous*. Really epigynous stamens (*i.e.* when the filaments are combined with the ovary) are very rare, unless the rest of the flower is epigynous.

144. An *epigynous disk* is a name given either to the thickened summit of the ovary in epigynous flowers, or very rarely to a real disk or enlargement of the receptacle closing over the ovary.

145. In the relative position of any two or more parts of the flower, whether in the same or in different whorls, they are

connivent, when nearer together at the summit than at the base

divergent, when further apart at the summit than at the base.

coherent, when united together, but so slightly that they can be separated with little or no laceration; and one of the two coherent parts, (usually the smallest or least important) is said to be *adherent* to the other. Grammatically speaking, these two terms convey nearly the same meaning but require a different form of phrase; practically however it has been found more convenient to restrict *cohesion* to the union of parts of the same whorl, and *adhesion* to the union of parts of different whorls.

connate, when so closely united that they cannot be separated without laceration. Each of the two connate parts, and especially that one which is considered the smaller or of the least importance, is said to be *adnate* to the other.

free, when neither coherent nor connate.

distinct is also used in the same sense, but is also applied to parts distinctly visible or distinctly limited.

§ 13. *The Fruit.*

146. The **Fruit** (15) consists of the ovary and whatever other parts of the flower are *persistent* (*i. e.* persist at the time the seed is ripe), usually enlarged, and more or less altered in shape and consistence. It encloses or covers the seed or seeds till the period of maturity, when it either opens for the seed to escape, or falls to the ground with the seed. When stalked, its stalk has been termed a *carpophore*.

147. Fruits are, in elementary works, said to be *simple* when the result of a single flower, *compound* when they proceed from several flowers closely packed or combined in a head. But as a fruit resulting from a single flower, with several distinct carpels, is compound in the sense in which that term is applied to the ovary, the terms *single* and *aggregate*, proposed for the fruit resulting from one or several flowers, may be more appropriately adopted In descriptive botany a fruit is always supposed to result from a single flower unless the contrary be stated. It may, like the pistil, be syncarpous or apocarpous (125); and as in many cases carpels united in the flower may become separate as they ripen, an apocarpous fruit may result from a syncarpous pistil.

148. The involucre or bracts often persist and form part of aggregate fruits, but very seldom so in single ones.

149. The receptacle becomes occasionally enlarged and succulent; if when ripe it falls off with the fruit, it is considered as forming part of it.

150. The adherent part of the calyx of epigynous flowers always persists and forms part of the fruit; the free part of the calyx of epigynous flowers or the calyx of perigynous flowers, either persists entirely at the top of or round the fruit, or the lobes alone fall off, or the lobes fall off with whatever part of the calyx is above the insertion of the petals, or the whole of what is free from the ovary falls off, including the disk bearing the petals. The calyx of hypogynous flowers usually falls off entirely or persists entirely. In general a calyx is called deciduous if any part falls off. When it persists it is either enlarged round or under the fruit, or it withers and dries up.

151. The corolla usually falls off entirely; when it persists it is usually withered and dry (*marcescent*), or very seldom enlarges round the fruit.

152. The stamens either fall off, or more or less of their filaments persist, usually withered and dry.

153. The style sometimes falls off or dries up and disappears; sometimes persists, forming a point to the fruit, or becomes enlarged into a wing or other appendage to the fruit.

154. The *Pericarp* is the portion of the fruit formed of the ovary and whatever adheres to it exclusive of and outside of the seed or seeds, exclusive also of the persistent receptacle, or of whatever portion of the calyx persists round the ovary without adhering to it.

155. Fruits have often external appendages called *wings* (alæ), *beaks*, *crests*, *awns*, etc., according to their appearance. They are either formed by persistent parts of the flower more or less altered, or grow out of the ovary or the persistent part of the calyx. If the appendage be a ring of hairs or scales round the top of the fruit, is is called a *pappus*.

156. Fruits are generally divided into *succulent*, (including *fleshy*, *pulpy* and *juicy* fruits) and *dry*. They are *dehiscent* when they open at maturity to let out the seeds, *indehiscent* when they do not open spontaneously but fall off with the seeds. Succulent fruits are usually indehiscent.

157. The principal kinds of succulent fruits are

the *Berry*, in which the whole substance of the pericarp is fleshy or pulpy, with the exception of the outer skin or rind, called the *Epicarp*. The seeds themselves are usually immersed in the pulp; but in some berries, the seeds are separated from the pulp by the walls of the cavity or cells of the ovary, which form as it were a thin inner skin or rind, called the *Endocarp*.

the *Drupe*, in which the pericarp, when ripe, consists of two distinct portions, an outer succulent one called the *Sarcocarp*, or *Mesocarp* (covered like the berry by a skin or epicarp), and an inner dry endocarp called the *Putamen*, which is either *cartilaginous* (of the consistence of parchment) or hard and woody. In the latter case it is commonly a *stone*, and the drupe a *stone-fruit*. When the putamen consists of several distinct stones or nuts, each enclosing a seed, they are called *pyrenes*, or sometimes *kernels*.

158. The principal kinds of dry fruits are

the *Capsule* or *Pod*,* which is dehiscent. When ripe the pericarp usually splits longitudinally into as many or twice as many pieces, called valves, as it contains cells or placentas. If these valves separate at the line of junction of the carpels, that is, along the line of the placentas or dissepiments, either splitting them or leaving them attached to the axis, the dehiscence is termed *septicidal*; if the valves separate between the placentas or dissepiment, the dehiscence is *loculicidal*, and the valves either bear the placentas or dissepiments along their middle line, or leave them attached to the axis. Sometimes also the capsule discharges its seeds by *slits*, *chinks*, or *pores*, more or less regularly arranged, or bursts irregularly, or separates into two parts by a horizontal line; in the latter case it is said to be *circumsciss*.

the *Nut* or *Achene*, which is indehiscent and contains but a single seed. When the pericarp is thin in proportion to the seed it encloses, the whole fruit (or each of its lobes) has the appearance of a single seed, and is so called in popular language. If the pericarp is thin and rather loose, it is often called a *Utricle*. A *Samara* is a nut with a wing at its upper end.

159. Where the carpels of the ovary are distinct (125) they may severally become as many distinct berries, drupes, capsules, or achenes. Separate carpels are usually more or less compressed laterally, with more or less prominent inner and outer edges, called *sutures*, and, if dehiscent, the carpel usually opens at these sutures. A *Follicle* is a carpel opening at the inner suture only. In some cases where the carpels are united in the ovary they will separate when ripe; they are then called *Cocci* if one-seeded.

160. The peculiar fruits of some of the large Orders have received special names, which will be explained under each Order. Such are the *siliqua* and *silicule* of Cruciferæ, the *legume* of Leguminosæ, the *pome* of *Pyrus* and its allies, the *pepo* of Cucurbitaceæ, the *cone* of Coniferæ, the *grain* or *Caryopsis* of Gramineæ, etc.

§ 14. *The Seed.*

161. The **Seed** is enclosed in the pericarp in the great majority of flowering plants, called therefore *Angiosperms*, or *angiospermous plants*. In *Coniferæ* and a very few allied genera, called *Gymnosperms*, or *gymnospermous plants*, the seed is naked, without any real pericarp. These truly gymnospermous plants must not be confounded with *Labiatæ*, *Boragineæ*, etc., which have also been falsely called gymnospermous, their small nuts having the appearance of seeds (158).

162. The seed when ripe contains an *embryo* or young plant, either filling or nearly filling the cavity, but not attached to the outer skin or the seed, or more or less immersed in a mealy, oily, fleshy, or horn-like substance, called the *albumen*, or *perisperm*. The presence or absence of this albumen, that is, the distinction between *albuminous* and *exalbuminous* seeds, is one of great importance. The embryo or albumen can often only be found or distinguished when the seed is quite ripe, or sometimes only when it begins to germinate.

163. The shell of the seed consists usually of two separable *coats*. The outer coat, called the *testa*, is usually the principal one, and in most cases the only one attended to in descriptions. It may be hard and *crustaceous*, woody or bony, or thin and *membranous* (skin-like), dry, or rarely succulent. It is sometimes expanded into *wings*, or bears a tuft of hair, cotton, or wool, called a *coma*. The inner coat is called the *tegmen*.

164 The *funicle* is the stalk by which the seed is attached to the placenta. It is occasionally enlarged into a membranous, pulpy, or fleshy appendage, sometimes spreading over a considerable part of the seed, or nearly enclosing it, called an *aril*. A *strophiole* or *caruncle* is a similar appendage proceeding from the testa by the side of or near the funicle.

165. The *hilum* is the scar left on the seed where it separates from the funicle. The *micropyle* is a mark indicating the position of the foramen of the ovule (133)

166. The **Embryo** (162) consists of the *Radicle* or base of the future root, one or two *Cotyledons* or future seed leaves, and the *Plumule* or future bud within the base of the cotyledons. In some seeds, especially where there is no albumen, these several parts are very conspicuous, in others they are very difficult to distinguish until the seed begins to germinate. Their observation, however, is of the greatest importance, for it is chiefly upon the distinction between the embryo with one or with two cotyledons that are founded the two great classes of phænogamous plants, *Monocotyledons* and *Dicotyledons*. Cotyledons are said to be *conduplicate* when folded once length-wise; *contortuplicate* when variously folded or twisted; *conferruminate* when so united that no line of separation can be traced.

* In English descriptions *pod* is more frequently used when it is long and narrow; *capsule*, or sometimes *pouch*, when it is short and thick or broad.

167. Although the embryo lies loose (unattached) within the seed, it is generally in some determinate position with respect to the seed or to the whole fruit. This position is described by stating the direction of the radicle next to or more or less remote from the *hilum*, or it is said to be *superior* if pointing towards the summit of the *fruit*, *inferior* if pointing towards the base of the *fruit*.

§ 15. *Accessory Organs.*

168. Under this name are included, in many elementary works, various external parts of plants which do not appear to act any essential part either in the vegetation or reproduction of the plant. They may be classed under four heads: *Tendrils* and *Hooks*, *Thorns* and *Prickles*, *Hairs* and *Glands*.

169. **Tendrils** (*cirrhi*) are usually abortive petioles, or abortive peduncles, or sometimes abortive ends of branches. They are simple or more or less branched, flexible, and coil more or less firmly round any objects within their reach, in order to support the plant to which they belong. *Hookes* are similar holdfasts, but of a firmer consistence, not branched, and less coiled.

170. **Thorns** and **Prickles** have been fancifully called the weapons of plants. A *Thorn* or *Spine* is the strongly pointed extremity of a branch, or abortive petiole, or abortive peduncle. A *Prickle* is a sharply pointed excrescence from the epidermis, and is usually produced on a branch on the petiole or veins of a leaf, or on a peduncle, or even on the calyx or corolla. When the teeth of a leaf or the stipules are pungent, they are also called *prickles*, not *thorns*. A plant is *spinous* if it has thorns, *aculeate* if it has prickles.

171. **Hairs**, in the general sense, or the *indumentum* (or clothing) of a plant, include all those productions of the epidermis which have, by a more or less appropriate comparison, been termed *bristles*, *hairs*, *down*, *cotton*, or *wool*.

172. Hairs are often branched. They are said to be *attached by the centre*, if parted from the base, and the forks spread along the surface in opposite directions; *plumose*, if the branches are arranged along a common axis, as in a feather; *stellate*, if several branches radiate horizontally. These stellate hairs have sometimes their rays connected together at the base, forming little flat circular disks attached by the centre, and are then called *scales* and the surface is said to be *scaly* or *lepidote*.

173. The *Epidermis*, or outer skin, of an organ, as to its surface and indumentum, is

smooth, when without any protuberance whatever.

glabrous, when without hairs of any kind.

glabrescent glabrœte, becoming glabrous.

striate, when marked with parallel longitudinal lines, either slightly raised or merely discoloured.

furrowed (*sulcate*) or *ribbed* (*costate*) when the parallel lines are more distinctly raised.

rugose, when wrinkled or marked with irregular raised or depressed lines.

umbilicate, when marked with a small round depression.

umbonate, when bearing a small boss like that of a shield.

viscous, *viscid*, or *glutinous*, when covered with a sticky or clammy exudation.

scabrous when rough to the touch.

tuberculate or *warted*, when covered with small, obtuse, wart-like protuberances.

muricate, when the protuberances are more raised and pointed but yet short and hard.

echinate, when the protuberances are longer and sharper, almost prickly.

setose or *bristly*, when bearing very stiff erect straight hairs.

glandular-setose, when the setæ or bristles terminate in a minute resinous head or drop. In some works, especially in the case of Roses and *Rubes*, the meaning of *setæ* has been restricted to such as are glandular.

glochidiate, when the setæ are hooked at the top.

pilose, when the surface is thinly sprinkled with rather long simple hairs.

hispid, when more thickly covered with rather stiff hairs.

hirsute, when the hairs are dense and not so stiff.

downy or *pubescent*, when the hairs are short and soft; *puberulent*, when slightly pubescent.

strigose, when the hairs are rather short and stiff, and lie close along the surface all in the same direction; *strigillose*, when slightly strigose.

tomentose or *cottony*, when the hairs are very short and soft, rather dense and more or less intricate, and usually white or whitish.

woolly (*lanate*), when the hairs are long and loosely intricate, like wool. The wool or tomentum is said to be *floccose* when closely intricate and readily detached, like fleece.

mealy (*farinose*), when the hairs are excessively short, intricate and white, and come off readily, having the appearance of meal or dust.

canescent or *hoary*, when the hairs are so short as not readily to be distinguished by the naked eye, and yet give a general whitish hue to the epidermis.

glaucous, when of a pale bluish-green, often covered with a fine bloom.

glaucescent, *subglaucous* or becoming glaucous.

174. The meanings here attached to the above terms are such as appear to have been most generally adopted, but there is much vagueness in the use practically made of many of them by different botanists. This is especially the case with the terms *pilose*, *hispid*, *hirsute*, *pubescent*, and *tomentose*.

175. The name of **Glands** is given to several different productions, and principally to the four following:—

1—Small wart-like or shield-like bodies, either sessile or sometimes stalked, of a fungous or somewhat fleshy consistence, occasionally secreting a small quantity of oily or resinous matter, but more frequently dry. They are generally few in number, often definite in their position and form, and occur chiefly on the petiole or principal veins of leaves, on the branches of inflorescences, or on the stalks or principal veins of bracts, sepals or petals.

2—Minute raised dots, usually black, red, or dark-coloured, of a resinous or oily nature, always superficial, and apparently exudations from the epidermis. They are often numerous on leaves, bracts, sepals, and green branches, and occur even on petals and stamens, more rarely on pistils. When raised upon slender stalks they are called *pedicellate* (or *stipitate*) *glands*, or *glandular hairs*, according to the thickness of the stalk.

3—Small, globular, oblong or even linear vesicles, filled with oil, imbedded in the substance itself of leaves, bracts, floral organs, or fruits. They are often very numerous, like transparent dots, sometimes few and determinate in form and position In the pericarp of *Umbelliferæ* they are remarkably regular and conspicuous, and take the name of *vittæ*.

4—*Lobes* of the disk (137), or other small fleshy excrescences within the flower, whether from the receptacle, calyx, corolla, stamens, or pistil.

Chap II. Classification, or Systematic Botany.

176. It has already been observed (3) that descriptions of plants should, as nearly as possible, be arranged under natural divisions, so as to facilitate the comparison of each plant with those most nearly-allied to it. The descriptions of plants here alluded to are descriptions of *species*, the natural divisions of the Flora refer to natural *groups of species*.

177. A **Species** comprises all the individual plants which resemble each other sufficiently to make us conclude that they are all, or *may have been* all, descended from a common parent. These individuals may often differ from each other in many striking particulars, such as the colour of the flower, size of the leaf, etc., but these particulars are such as experience teaches us are liable to vary in the seedlings raised from one individual.

178. When a large number of the individuals of a species differ from the others in any striking particular they constitute a **Variety**. If the variety generally comes true from seed, it is often called a *Race*.

179. A *Variety* can only be propagated with certainty by grafts, cuttings, bulbs, tubers, or any other method which produces a new plant by the development of one or more buds taken from the old one. A *Race* may with care be propagated by seed, although seedlings will always be liable, under certain circumstances, to lose those particulars which distinguish it from the rest of the species. A real *Species* will always come true from seed.

180. The known species of plants (now near 100,000) are far too numerous for the human mind to study without classification, or even to give distinct single names to. To facilitate these objects, an admirable system, invented by Linnæus has been universally adopted, viz. one common substantive name is given to a number of species which resemble each other more than they do any other species; the species so collected under one name are collectively called a **Genus**, the common name being the *generic* name. Each species is then distinguished from the others of the same genus by the addition of an adjective epithet or *specific name*. Every species has thus a botanical name of two words. In Latin, the language usually used for the purpose, the first word is a substantive and designates the genus; the second, an adjective, indicates the species.

181. The genera thus formed being still too numerous (above 6,000) for study without further arrangement, they have been classed upon the same principles, viz. genera which resemble each other more than they do any other genera, have been collected together into groups of a higher degree called **Families** or **Natural Orders**, to each of which a common name has been given. This name is in Latin an adjective plural, usually taken from the name of some one *typical* genus, generally the best known, the first discovered, or the most marked (e. g. *Ranunculaceæ* from *Ranunculus*) This is however for the purpose of study and comparison. To speak of a species, to refer to it and identify it, all that is necessary is to give the generic and specific names.

182. Natural Orders themselves (of which we reckon near 200) are often in the same manner collected into **Classes**; and where Orders contain a large number of genera, or genera a large number of species, they require further classification. The genera of an Order are then collected into minor groups called *Tribes*, the species of a genus into *Sections*, and in a few cases this intermediate classification is carried still further. The names of these several groups the most generally adopted are as follows, beginning with the most comprehensive or highest:—

Classes.	Genera.
Subclasses or *Alliances*.	*Subgenera*.
Natural Orders or Families.	*Sections*.
Suborders.	*Subsections*.
Tribes.	Species.
Subtribes.	Varieties.
Divisions.	
Subdivisions.	

183. The characters (3) by which a species is distinguished from all other species of the same genus are collectively called the *specific* character of the plant; those by which its genus is distinguished from other genera of the Order, or its Order from other Orders, are respectively called the *generic* or *ordinal* character, as the case may be. The *habit* of a plant, of a species, a genus, etc., consists of such general characters as strike the eye at first sight, such as size, colour, ramification, arrangement of the leaves, inflorescence, etc., and are chiefly derived from the organs of vegetation.

184. Classes, Orders, Genera, and their several subdivisons, are called *natural* when, in forming them, all resemblances and differences are taken into account, valuing them according to their evident or presumed importance, *artificial*, when resemblances and differences in some one or very few particulars only are taken into account independently of all others.

185. The number of species included in a genus, or the number of genera in an Order, is very variable. Sometimes two or three or even a single species may be so different from all others as to constitute the entire genus; in others, several hundred species may resemble each other so much as to be all included in one genus; and there is the same discrepancy in the number of genera to a Family. There is moreover, unfortunately, in a number of instances, great difference of opinion as to whether certain plants differing from each other in certain particulars are varieties of one species or belong to distinct species; and again, whether two or more groups of species should constitute as many sections of one genus, or distinct genera, or tribes of one Order, or even distinct Natural Orders. In the former case, as a species is supposed to have a real existence in nature, the question is susceptible of argument, and sometimes of absolute proof. But the place a group should occupy in the scale of degree is very arbitrary, being often a mere question of convenience. The more subdivisions upon correct principles are multiplied, the more they facilitate the study of plants, provided always the main resting-points for constant use, the Order and the Genus, are comprehensive and distinct. But if every group into which a genus can be divided be erected into a distinct genus, with a substantive name to be remembered whenever a species is spoken of, all the advantages derived from the beautiful simplicity of the Linnæan nomenclature are gone.

Chap. III. Vegetable Anatomy and Physiology.

§ 1. *Structure and Growth of the Elementary Tissues.*

186. If a very thin slice of any part of a plant be placed under a microscope of high magnifying power, it will be found to be made up of variously shaped and arranged ultimate parts, forming a sort of honeycombed structure. These ultimate parts are called *cells*, and form by their combination the *elementary tissues* of which the entire plant is composed.

187. A cell in its simplest state is a closed membranous sac, formed of a substance permeable by fluids, though usually destitute of visible pores. Each cell is a distinct individual, separately formed and separately acting, though cohering with the cells with which it is in contact, and partaking of the common life and action of the tissue of which it forms a part. The membranes separating or enclosing the cells are also called their *walls*.

188. Botanists usually distinguish the following tissues:—

(1) *Cellular tissue*, or *parenchyma*, consists usually of thin-walled cells, more or less round in form, or with their length not much exceeding

their breadth, and not tapering at the ends. All the soft parts of the leaves, the pith of stems, the pulp of fruits, and all young growing parts, are formed of it. It is the first tissue produced, and continues to be formed while growth continues, and when it ceases to be active the plant dies.

(2) *Woody tissue*, or *prosenchyma*, differs in having its cells considerably longer than broad, usually tapering at each end into points and overlapping each other. The cells are commonly thick-walled; the tissue is firm, tenacious, and elastic, and constitutes the principal part of wood, of the inner bark, and of the nerves and veins of leaves, forming, in short, the framework of the plant.

(3) *Vascular tissue*, or the *vessels* or *ducts* of plants, so called from the mistaken notion that their functions are analogous to those of the vessels (veins and arteries) of animals. A *vessel* in plants consists of a vertical row of cells, which have their transverse partition-walls obliterated, so as to form a continuous tube. All phænogamous plants, as well as ferns and a few other cryptogamous plants, have vessels, and are therefore called *vascular plants*; so the majority of cryptogams having only cellular tissue are termed *cellular plants*. Vessels have their sides very variously marked; some, called *spiral vessels*, have a spiral fibre coiled up their inside, which unrolls when the vessel is broken; others are marked with longitudinal slits, cross bars, minute dots or pits, or with transverse rings. The size of vessels is also very variable in different plants; in some they are of considerable size and visible to the naked eye in cross sections of the stem, in others they are almost absent or can only be traced under a strong magnifier.

189. Various modifications of the above tissues are distinguished by vegetable anatomists under names which need not be enumerated here as not being in general practical use. *Air-vessels, cysts, turpentine vessels, oil reservoirs*, etc., are either cavities left between the cells, or large cells filled with peculiar secretions.

190. When tissues are once formed, they increase, not by the general enlargement of the whole of the cells already formed, but by *cell-division*, that is, by the division of young and vitally active cells, and the enlargement of their portions. In the formation of the embryo, the first cell of the new plant is formed, not by division, but around a segregate portion of the contents of a previously existing cell, the embryo-sac. This is termed *free cell-formation*, in contradistinction to cell-division.

191. A young and vitally active cell consists of the *outer wall*, formed of a more or less transparent substance called *cellulose*, permeable by fluids, and of ternary chemical composition (carbon, hydrogen, and oxygen); and of the *cell-contents*, usually viscid or mucilaginous, consisting of *protoplasm*, a substance of quaternary chemical composition (carbon, hydrogen, oxygen, and nitrogen), which fills an important part in cell-division and growth. Within the cell (either in the centre or excentrical) is usually a minute, soft, subgelatinous body called the *nucleus*, whose functions appear to be intimately connected with the first formation of the new cell. As this cell increases in size and its walls in thickness, the protoplasm and watery cell-sap become absorbed or dried up, the firm cellulose wall alone remaining as a permanent fabric, either empty or filled with various organized substances produced or secreted within it.

192. The principal organized contents of cells are

sap, the first product of the digestion of the food of plants; it contains the elements of vegetable growth in a dissolved condition.

sugar, of which there are two kinds, called *cane-sugar* and *grape-sugar*. It usually exists dissolved in the sap. It is found abundantly in growing parts, in fruits, and in germinating seeds.

dextrine, or vegetable mucilage, a gummy substance, between mucilage and starch.

starch or *fecula*, one of the most universal and conspicuous of cell-contents, and often so abundant in farinaceous roots and seeds as to fill the cell-cavity. It consists of minute grains called *starch-granules*, which vary in size, and are marked with more or less conspicuous concentriclines. The chemical constitution of starch is the same as that of cellulose; it is unaffected by cold water, but forms a jelly with boiling water, and turns blue when tested by iodine.

chlorophyll, very minute granules, containing nitrogen, and coloured green under the action of sunlight. These granules are most abundant in the layers of cells immediately below the surface or epidermis of leaves and young bark. The green colouring matter is soluble in alcohol, and may thus be removed from the granules.

chromule, a name given to a similar colouring-matter when green.

wax, oils, camphor, and *resinous* matter, are common in cells or in cavities in the tissues between the cells, also various mineral substances, either in an amorphous state or as microscopic crystals, when they are called *Raphides*.

§ 2. *Arrangement of the Elementary Tissues, or Structure of the Organs of Plants.*

193. Leaves, young stems, and branches, and most parts of phænogamous plants, during the first year of their existence, consist anatomically of

1, a *cellular system*, or continuous mass of cellular tissue, which is developed both vertically as the stem or other parts increase in length, and horizontally or laterally as they increase in thickness or breadth. It surrounds or is intermixed with the fibro-vascular system, or it may exist alone in some parts of phænogamous plants, as well as in cryptogamous ones.

2, a *fibro-vascular system*, or continuous mass of woody and vascular tissue, which is gradually introduced vertically into, and serves to bind together the cellular system. It is continued from the stem into the petioles and veins of the leaves, and into the pedicels and parts of the flowers, and is never wholly wanting in any phænogamous plant.

3, an *epidermis*, or outer skin, formed of one or more layers of flattened (horizontal), firmly coherent, and usually empty cells, with either thin and transparent or thick and opaque walls. It covers almost all parts of plants exposed to the outward air, protecting their tissues from its immediate action, but is wanting in those parts of aquatic plants which are constantly submerged.

194. The epidermis is frequently pierced by minute spaces between the cells, called *Stomates*. They are oval or mouth-shaped, bordered by *lips*, formed of two or more elastic cells so disposed as to cause the stomate to open in a moist, and to close up in a dry state of the atmosphere. They communicate with intercellular cavities, and are obviously designed to regulate evaporation and respiration. They are chiefly found upon leaves, especially on the under surface.

195. When a phænogamous plant has outlived the first season of its growth, the anatomical structure of its stem or other perennial parts becomes more complicated and very different in the two great classes of phænogamous plants called *Exogens* and *Endogens*, which correspond with very few exceptions to the two classes Dicotyledons and Monocotyledons (167), founded on the structure of the embryo. In Exogens (Dicotyledons) the woody system is placed in concentric layers between a central *pith* (198, 1), and an external separable *bark* (198, 5). In Endogens (Monocotyledons) the woody system is in separate small bundles or fibres running through the cellular system without apparent order, and there is usually no distinct central pith, nor outer separable bark.

196. The anatomical structure is also somewhat different in the different organs of plants. In the **Root**, although it is constructed generally on the same plan as the stem, yet the regular organization, and the difference between Exogens and Endogens, is often disguised or obliterated by irregularities of growth, or by the production of large quantities of cellular tissue filled with starch or other substances (192). There is seldom, if ever, any distinct pith, the concentric circles of fibro-vascular tissue in Exogens are often very indistinct or have no relation to seasons of growth, and the epidermis has no stomates.

197. In the **Stem** or branches, during the first year or season of their growth, the difference between Exogens and Endogens is not always very conspicuous. In both there is a tendency to a circular arrangement of the fibro-vascular system, leaving the centre either vacant or filled with cellular tissue (pith) only, and a more or less distinct outer rind is observable even in several Endogens More frequently, however, the distinction is already very apparent the first season, especially towards its close. The fibro-vascular bundles in Endogens usually anastomose but little, passing continuously into the branches and leaves. In Exogens the circle of fibro vascular bundles forms a more continuous cylinder of network emitting lateral offsets into the branches and leaves.

198. The Exogenous stem, after the first year of its growth, consists of

1, the *pith*, a cylinder of cellular tissue, occupying the centre or longitudinal axis of the stem. It is active only in young stems or branches, becomes dried up and compressed as the wood hardens, and often finally disappears, or is scarcely distinguishable in old trees.

2, the *medullary sheath*, which surrounds and encases the pith. It abounds in spiral vessels (188, 3), and is in direct connection when young, with the leaf-buds and branches, with the petioles and veins of leaves, and other ramifications of the system. Like the pith, it gradually disappears in old wood.

3, the *wood*, which lies immediately outside the medullary sheath. It is formed of woody tissue (188, 2), through which, in most cases, vessels (188, 3) variously disposed are interspersed. It is arranged in annual concentric circles (211), which usually remain active during several years, but in older stems the central and older layers become hard, dense, comparatively inactive, and usually deeper coloured, forming what is called *heart-wood* or *duramen*, the outer, younger, and usually paler-coloured living layers constituting the *sapwood* or *alburnum*.

4, the *medullary rays*, which form vertical plates, originating in the pith, and, radiating from thence, traverse the wood and terminate in the bark. They are formed of cellular tissue, keeping up a communication between the living portion of the centre of the stem and its outer surface. As the heart-wood is formed, the inner portion of the medullary rays ceases to be active, but they usually may still be seen in old wood, forming what carpenters call the *silver grain*.

5, the *bark*, which lies outside the wood, within the epidermis. It is, like the wood, arranged in annual concentric circles (211), of which the outer older ones become dry and hard, forming the *corky layer* or *outer bark*, which, as it is distended by the thickening of the stem, either cracks or is cast off with the epidermis, which is no longer distinguishable. Within the corky layer is the *cellular*, or *green*, or *middle bark*, formed of loose thin walled pulpy cells containing chlorophyll (192), and which is usually the layer of the preceding season. The innermost and youngest circle, next the young wood, is the *liber* or *inner bark*, formed of long tough woody tissue called *bast-cells*.

199. The Endogenous stem, as it grows old, is not marked by the concentric circles of Exogens. The wood consists of a *matrix* of cellular tissue irregularly traversed by vertical cords or bundles of woody and vascular tissue, which are in connection with the leaves. These vascular bundles change in structure and direction as they pass down the stem, losing their vessels, they retain only their bast or long wood cells, usually curving outwards towards the rind. The old wood becomes more compact and harder towards the circumference than in the centre. The epidermis or rind either hardens so as to prevent any increase of diameter in the stem, or it distends, without increasing in thickness or splitting or casting off any outer layers.

200. In the **Leaf**, the structure of the petioles and principal ribs or veins is the same as that of the young branches of which they are ramifications. In the expanded portion of the leaf the fibro vascular system becomes usually very much ramified, forming the smaller veins. These are surrounded and the interstices filled up by a copious and very active cellular tissue. The majority of leaves are horizontal, having a differently constructed upper and under surface. The cellular stratum forming the upper surface consists of closely set cells, placed vertically, with their smallest ends next the surface, and with few or no stomates in the epidermis. In the stratum forming the under surface, the cells are more or less horizontal, more loosely placed, and have generally empty spaces between them, with stomates in the epidermis communicating with these intercellular spaces. In vertical leaves (as in a large number of Australian plants) the two surfaces are nearly similar in structure.

201. When leaves are reduced to scales, acting only as protectors of young buds, or without taking any apparent part in the economy of vegetable life, their structure, though still on the same plan, is more simple ; their fibro-vascular system is less ramified, their cellular system more uniform, and there are few or no stomates.

202. Bracts and floral envelopes, when green and much developed, resemble leaves in their anatomical structure, but in proportion as they are reduced to scales or transformed into petals, they lose their stomates, and their systems, both fibro-vascular and the cellular, become more simple and uniform or more slender and delicate.

203. In the stamens and pistils the structure is still nearly the same. The fibro-vascular system surrounded by and intermixed with the cellular tissue, is usually simple in the filaments and style, more or less ramified in the flattened or expanded parts, such as the anther cases, the walls of the ovary, or carpellary leaves, etc. The pollen consists of granular cells variously shaped, marked, or combined, peculiar forms being constant in the same species, or often in large genera, or even Orders. The stigmatic portion of the pistil is a mass of loosely cellular substance, destitute of epidermis, and usually is in communication with the ovary by the channel running down the centre of the style.

204. Tubers, fleshy thickenings of the stem or other parts of the plant, succulent leaves or branches, the fleshy, woody, or bony parts of fruits, the albumen, and the thick fleshy parts of embryos, consist chiefly of largely developed cellular tissue, replete with starch or other substances (192), deposited apparently in most cases for the eventual future use of the plant or its parts when recalled into activity at the approach of a new season.

205. Hairs (171) are usually expansions or processes of the epidermis, and consist of one or more cells placed end to end. When thick or hardened into prickles, they still consist usually of cellular tissue only. Thorns (170) contain more or less of a fibro-vascular system, according to their degree of development.

206. Glands, in the primary sense of the word (175, 1), consist usually of a rather loose cellular tissue without epidermis, and often replete with resinous or other substances.

§ 3. *Growth of the Organs.*

207. Roots grow in length constantly and regularly at the extremities only of their fibres, in proportion as they find the requisite nutriment. They form no buds containing the germ of future branches, but their fibres proceed irregularly from any part of their surface without previous indication, and when their growth has been stopped for a time, either wholly by the close of the season, or partially by a deficiency of nutriment at any particular spot, it will on the return of favourable circumstances, be resumed at the same point, if the growing extremities be uninjured. If during the dead season, or at any other time, the growing extremity is cut off, dried up, or otherwise injured, or stopped by a rock or other obstacle opposing its progress, lateral fibres will be formed on the still living portion, thus enabling the root as a whole to diverge in any direction, and travel far and wide when lured on by appropriate nutriment.

208. This growth is not however by the successive formation of terminal cells attaining at once their full size. The cells first formed on a fibre commencing or renewing its growth, will often dry up and form a kind of terminal cap, which is pushed on as cells are formed immediately under it ; and the new cells, constituting a greater or less portion of the ends of the fibres, remain some time in a growing state before they have attained their full size.

209. The roots of Exogens, when perennial, increase in thickness like stems by the addition of concentric layers, but these are usually much less distinctly marked; and in a large number of perennial Exogens and most Endogens the roots are annual, perishing at the close of the season, fresh adventitious roots springing from the stock when vegetation commences the following season.

210. The stem, including its branches and appendages (leaves, floral organs, etc.), grows in length by additions to its extremity, but a much greater proportion of the extremity and branches remains in a growing and expanding state for a much longer time than in the case of the root. At the close of one season, leaf-buds or seeds are formed, each containing the germ of a branch or young plant to be produced the following season. At a very early stage of the development of these buds or seeds, a commencement may be found of many of the leaves it is to bear, and before a leaf unfolds, every leaflet of which it is to consist, every lobe or tooth which is to mark its margin, may often be traced in miniature, and thenceforth till it attains its full size, the branch grows and expands in every part. In some cases however the lower part of a branch and more rarely (e. g. in some *Meliaceæ*) the lower part of a compound leaf attains its full size before the young leaves or leaflets of the extremity are yet formed.

211. The perennial stem, if exogenous (198), grows in thickness by the addition every season of a new layer or ring of wood between the outermost preceding layer and the inner surface of the bark, and by the formation of a new layer or ring of bark within the innermost preceding layer and outside the new ring of wood, thus forming a succession of concentric circles. The sap elaborated by the leaves finds its way, in a manner not as yet absolutely ascertained, into the *cambium-region*, a zone of tender thin-walled cells connecting the wood with the bark, by the division and enlargement of which new cells (190) are formed. These cells separate in layers, the inner ones constituting the new ring of wood, and the outer ones the new bark or liber. In most exogenous trees, in temperate climates, the seasons of growth correspond with the years, and the rings of wood remain sufficiently distinct to indicate the age of the tree; but in many tropical and some evergreen trees, two or more rings of wood are formed in one year.

212. In endogenous perennial stems (199), the new wood or woody fibre is formed towards the centre of the stem, or irregularly mingled with the old. The stem consequently either only becomes more dense without increasing in thickness, or only increases by gradual distention, which is never very considerable. It affords therefore no certain criterion for judging of the age of the tree.

213. Flowers have generally all their parts formed, or indicated by protuberances or growing cells at a very early stage of the bud. These parts are then usually more regularly placed than in the fully developed flower. Parts which afterwards unite are then distinct, many are present in this rudimentary state which are never further developed, and parts which are afterwards very unequal or dissimilar are perfectly alike at this early period. On this account flowers in this very early stage are supposed by some modern botanists to be more *normal*, that is, more in conformity to a supposed type; and the study of the early formation and growth of the floral organs, called *Organogenesis*, has been considered essential for the correct appreciation of the affinities of plants. In some cases, however, it would appear that modifications of development, not to be detected in the very young bud, are yet of great importance in the distinction of large groups of plants, and that *Organogenesis*, although it may often assist in clearing up a doubtful point of affinity, cannot nevertheless be exclusively relied on in estimating the real value of peculiarities of structure.

214. The flower is considered as a *bud* (*flower-bud, alabastrum*) until the perianth expands, the *period of flowering* (*anthesis*) is that which elapses from the first expanding of the perianth, till the pistil is set or begins to enlarge, or, when it does not set, until the stamens and pistil wither or fall. After that, the enlarged ovary takes the name of *young fruit*.

215. At the close of the season of growth, at the same time as the leaf buds or seeds are formed containing the germ of future branches or plants, many plants form also, at or near the bud or seed, large deposits, chiefly of starch. In many cases,—such as the tubers of a potato or other root-stock, the scales or thickened base of a bulb, the albumen or the thick cotyledons of a seed,—this deposit appears to be a store of nutriment, which is partially absorbed by the young branch or plant during its first stage of growth, before the roots are sufficiently developed to supply it from without. In some cases, however, such as the fleshy thickening of some stems or peduncles, the pericarps of fruits which perish long before *germination* (the first growth of the seed), neither the use nor the cause of these deposits has as yet been clearly explained.

§ 4. *Functions of the Organs.*

216. The functions of the Root are,—1. To fix the plant in or to the soil or other substance on which it grows. 2. To absorb nourishment from the soil, water, or air, into which the fibres have penetrated (or from other plants in the case of parasites), and to transmit it rapidly to the stem. The absorption takes places through the young growing extremities of the fibres, and through a peculiar kind of hairs or absorbing organs which are formed at or near those growing extremities. The transmission to the stem is through the tissues of the root itself. The nutriment absorbed consists chiefly of carbonic acid and nitrogen or nitrogenous compounds dissolved in water. 3. In some cases roots secrete or exude small quantities of matter in a manner and with a purpose not satisfactorily ascertained.

217. The Stem and its branches support the leaves, flowers, and fruit, transmit the crude sap, or nutriment absorbed by the roots and mixed with previously organized matter, to the leaves, and retransmit the assimilated or elaborated sap from the leaves to the growing parts of the plant, to be there used up, or to form deposits for future use (204). The transmission of the ascending crude sap appears to take place chiefly through the elongated cells associated with the vascular tissues, passing from one cell to another by a process but little understood, but known by the name of *endosmose*

218. Leaves are functionally the most active of the organs of vegetation. In them is chiefly conducted digestion or *Assimilation*, a name given to the process which accomplishes the following results:—1. The chemical decomposition of the oxygenated matter of the sap, the absorption of carbonic acid, and the liberation of pure oxygen at the ordinary temperature of the air. 2. A counter-operation by which oxygen is absorbed from the atmosphere and carbonic acid is exhaled. 3. The transformation of the residue of the crude sap into the organized substances which enter into the composition of the plant. The exhalation of oxygen appears to take place under the influence of solar heat and light, chiefly from the under surface of the leaf, and to be in some measure regulated by the stomates; the absorption of oxygen goes on always in the dark, and in the daytime also in certain cases. The transformation of the sap is effected within the tissues of the leaf, and continues probably more or less throughout the active parts of the whole plant.

219. The Floral Organs seldom contribute to the growth of the plant on which they are produced, their functions are wholly concentrated on the formation of the seed with the germ of a future plant.

220. The Perianth (calyx and corolla) acts in the first instance in protecting the stamens and pistils during the early stages of their development. When expanded, the use of the brilliant colours which they often display, of the sweet or strong odours they emit, has not been adequately explained. Perhaps they may have great influence in attracting those insects whose concurrence has been shown in many cases to be necessary for the due transmission of the pollen from the anther to the stigma.

221. The pistil, when stimulated by the action of the pollen, forms and nourishes the young seed. The varied and complicated contrivances by which the pollen is conveyed to the stigma, whether by elastic action of the organs themselves, or with the assistance of wind, of insects, or other extraneous agents, have been the subject of numerous observations and experiments of the most distinguished naturalists, and are yet far from being fully investigated. Their details, however, as far as known, would be far too long for the present outline.

222. The fruit nourishes and protects the seed until its maturity, and then often promotes its dispersion by a great variety of contrivances or apparently collateral circumstances, *e. g.* by an elastic dehiscence which casts the seed off to a distance, by the development of a pappus, wings, hooked —

other appendages, which allows them to be carried off by winds, or by animals, etc., to which they may adhere; by their small specific gravity, which enables them to float down streams, by their attractions to birds, etc., when taking them for food, drop them often at great distances, etc. Appendages to the seeds themselves also often promote dispersion.

223. Hairs have various functions. The ordinary indumentum (171) of stems and leaves indeed seems to take little part in the economy of the plant besides perhaps some occasional protection against injurious atmospheric influences, but the root hairs (216) are active absorbents, the hairs on styles and other parts of flowers appear often materially to assist the transmission of pollen, and the exudations of glandular hairs (175,2) are often too copious not to exercise some influence on the phenomena of vegetation. The whole question, however, of vegetable exudations and their influence on the economy of vegetable life, is as yet but imperfectly understood.

Chap. IV. Collection, Preservation, and Determination of Plants.

224. Plants can undoubtedly be most easily and satisfactorily examined when freshly gathered. But time will rarely admit of this being done, and it is moreover desirable to compare them with other plants previously observed or collected. *Specimens* must, therefore, be selected for leisurely observation at home, and preserved for future reference. A collection of such specimens constitutes a *Herbarium.*

225. A botanical **Specimen**, to be perfect, should have *root, stem, leaves, flowers* (both open and in bud) and *fruit* (both young and mature). It is not, however, always possible to gather such complete specimens, but the collector should aim at completeness. Fragments such as leaves without flowers, or flowers without leaves, are of little or no use.

226. If the plant is small (not exceeding 15 in.) or can be reduced to that length by folding, the specimen should consist of the whole plant, including the principal part of the root. If it be too large to preserve the whole, a good flowering branch should be selected, with the foliage as low down as can be gathered with it; and one or two of the lower stem-leaves or radical leaves, if any, should be added, so as to preserve as much as possible of the peculiar aspect of the plant.

227. The specimens should be taken from healthy uninjured plants of a medium size. Or if a specimen be gathered because it looks a little different from the majority of those around it, apparently belonging to the same species, a specimen of the more prevalent form should be taken from the same locality for comparison.

228. For bringing the specimens home, a light portfolio of pasteboard, covered with calico or leather, furnished with straps and buckles for closing, and another for slinging on the shoulder, and containing a few sheets of stout coarse paper, is better than the old-fashioned tin box (except, perhaps, for stiff prickly plants and a few others). The specimens as gathered are placed between the leaves of paper, and may be crowded together if not left long without sorting.

229. If the specimen brought home be not immediately determined when fresh, but dried for future examination, a note should be taken of the time, place, and situation in which it was gathered; of the stature, habit, and other particulars relating to any tree, shrub, or herb of which the specimen is only a portion; of the kind of root it has; of the colour of the flower; or of any other particulars which the specimen itself cannot supply, or which may be lost in the process of drying. These memoranda, whether taken down in the field or from the living specimen when brought home, should be written on a label attached to the specimen or preserved with it.

230. To dry specimens, they are laid flat between several sheets of bibulous paper, and subjected to pressure. The paper is subsequently changed at intervals, until they are dry.

231. In laying out the specimen, care should be taken to preserve the natural position of the parts as far as consistent with the laying flat. In general, if the specimen is fresh and not very slender, it may be simply laid on the lower sheet, holding it by the stalk and drawing it slightly downwards; then, as the upper sheet is laid over, if it be slightly drawn downwards as it is pressed down, it will be found, after a few trials, that the specimen will have retained a natural form with very little trouble. If the specimen has been gathered long enough to have become flaccid, it will require more care in laying the leaves flat and giving the parts their proper direction. Specimens kept in tin boxes will also often have taken unnatural bends which will require to be corrected.

232. If the specimen is very bushy, some branches must be thinned out, but always so as to show where they have been. If any part, such as the head of a thistle, the steam of an *Orobanche*, or the bulb of a Lily, be very thick, a portion of what is to be the under side of the specimen may be sliced off. Some thick specimens may be split from top to bottom before drying.

233. If the specimen be succulent or tenacious of life, such as a *Sedum* or an *Orchis*, it may be dipped in boiling water *all but the flowers.* This will kill the plant at once, and enable it to be dried rapidly, losing less of its colour or foliage than would otherwise be the case. Dipping in boiling water is also useful in the case of Heaths and other plants which are apt to shed their leaves during the process of drying.

234. Plants with very delicate corollas may be placed between single leaves of very thin unglazed tissue-paper. In shifting these plants into dry paper the tissue-paper is not to be removed, but lifted with its contents on to the dry paper.

235. The number of sheets of paper to be placed between each specimen or sheet of specimens, will depend, on the one hand, on the thickness and humidity of the specimens; on the other hand, on the quantity and quality of the paper one has at command. The more and the better the paper, the less frequently will it be necessary to change it, and the sooner the plants will dry. The paper ought to be coarse, stout, and unsized Common blotting-paper is much too tender.

236. Care must be taken that the paper used is well dried. If it be likewise hot, all the better; but it must then be very dry; and wet plants put into hot paper will require changing very soon, to prevent their turning black, for hot damp without ventilation produces fermentation, and spoils the specimens.

237 For pressing plants, various more or less complicated and costly presses are made. None is better than a pair of boards the size of the paper, and a stone or other heavy weight upon them if at home, or a pair of strong leather straps round them if travelling. Each of these boards should be double, that is, made of two layers of thin boards, the opposite way of the grain, and joined together by a row of clenched nails round the edge, without glue. Such boards, in deal, rather less than half an inch thick (each layer about 2½ lines) will be found light and durable.

238. It is useful also to have extra boards or pasteboards the size of the paper, to separate thick plants from thin ones, wet ones from those nearly dry, etc. Open wooden frames with cross-bars, or frames of strong wire-work lattice, are still better than boards for this purpose, as accelerating the drying by promoting ventilation.

239. The more frequently the plants are shifted into dry paper the better. Excepting for very stiff or woody plants, the first pressure should be light, and the first shifting, if possible, after a few hours. Then, or at the second shifting, when the specimens will have lost their elasticity, will be the time for putting right any part of a specimen which may have taken a wrong fold or a bad direction. After this the pressure may be gradually increased, and the plants left from one to several days without shifting. The exact amount of pressure to be given will depend on the consistence of the specimens, and the amount of paper. It must only be borne in mind that too much pressure crushes the delicate parts, too little allows them to shrivel, in both cases interfering with their future examination.

240. The most convenient specimens will be made, if the drying paper is the same size as that of the herbarium in which they are to be kept. That of writing demy, rather more than 16 inches by 10½ inches, is a common and very convenient size. A small size reduces the specimens too much, a large size is both costly and inconvenient for use.

241. When the specimens are quite dry and stiff, they may be packed up in bundles with a single sheet of paper between each layer, and this paper need not be bibulous. The specimens may be placed very closely on the sheets, but not in more than one layer on each sheet, and care must be taken to protect the bundles by sufficient covering from the effects of external moisture or the attacks of insects.

242. In laying the specimens into the herbarium, no more than one species should ever be fastened on one sheet of paper, although several specimens of the same species may be laid side by side. And throughout the process of drying, packing, and laying in, great care must be taken that the labels be not separated from the specimens they belong to.

243. To examine or dissect flowers or fruits in dried specimens it is necessary to soften them. If the parts are very delicate, this is best done by gradually moistening them in cold water; in most cases, steeping them in boiling water or in steam is much quicker. Very hard fruits and seeds will require boiling to be able to dissect them easily.

244. For dissecting and examining flowers in the field, all that is necessary is a penknife and a pocket-lens of two or three glasses from 1 to 2 inches focus. At home it is more convenient to have a mounted lens or simple microscope, with a stage holding a glass plate, upon which the flowers may be laid; and a pair of dissectors, one of which should be narrow and pointed, or a mere point, like a thick needle, in a handle; the other should have a pointed blade, with a sharp edge, to make clean sections across the ovary. A compound microscope is rarely necessary, except in cryptogamic botany and vegetable anatomy. For the simple microscope, lenses of ¼, ½, 1, and 1½ inches focus are sufficient.

245. To assist the student in *determining* or ascertaining the name of a plant belonging to a Flora, analytical tables should be prefixed to the Orders, Genera, and Species. These tables should be so constructed as to contain, under each bracket, or equally indented, two (rarely three or more) alternatives as nearly as possible contradictory or incompatible with each other, each alternative referring to another bracket, or having under it another pair of alternatives further indented. The student having a plant to determine, will first take the general table of Natural Orders, and examining his plant at each step to see which alternative agrees with it, will be led on to the Order to which it belongs; he will then compare it with the detailed character of the Order given in the text. If it agrees, he will follow the same course with the table of the genera of that Order, and again with the table of species of the genus. But in each case, if he finds that his plant does not agree with the detailed description of the genus or species to which he has thus been referred, he must revert to the beginning and carefully go through every step of the investigation before he can be satisfied. A fresh examination of his specimen, or of others of the same plant, a critical consideration of the meaning of every expression in the characters given, may lead him to detect some minute point overlooked or mistaken, and put him into the right way. Species vary within limits which it is often very difficult to express in words, and it proves often impossible, in framing these analytical tables, so to divide the genera and species, that those which come under one alternative should absolutely exclude the others. In such doubtful cases both alternatives must be tried before the student can come to the conclusion that his plant is not contained in the Flora, or that it is erroneously described.

246. In those Floras where analytical tables are not given, the student is usually guided to the most important or prominent characters of each genus or species, either by a general summary prefixed to the genera of an Order or to the species of the genus, for all such genera or species; or by a special summary immediately preceding the detailed description of each genus or species. In the latter case this summary is called a *diagnosis*. Or sometimes the important characters are only indicated by italicizing them in the detailed description.

247. It may also happen that the specimen gathered may present some occasional or accidental anomalies peculiar to that single one, or to a very few individuals, which may prevent the species from being at once recognized by its technical characters. It may be useful here to point out a few of these anomalies which the botanist may be most likely to meet with. For this purpose we may divide them into two classes, viz.:

(1.) *Aberrations from the ordinary type or appearance of a species for which some general cause may be assigned.*

A bright, light, and open situation, particularly at considerable elevations above the sea, or at high latitudes, without too much wet or drought, tends to increase the size and heighten the colour of flowers, in proportion to the stature and foliage of the plant.

Shade, on the contrary, especially if accompanied by richness of soil and sufficient moisture, tends to increase the foliage and draw up the stem, but to diminish the number, size, and colour of the flowers.

A hot climate and dry situation tend to increase the hairs, prickles, and other productions of the epidermis, to shorten and stiffen the branches, rendering thorny plants yet more spinous. Moisture in a rich soil has a contrary effect.

The neighbourhood of the sea, or a saline soil or atmosphere, imparts a thicker and more succulent consistence to the foliage and almost every part of the plant, and appears not unfrequently to enable plants usually annual to live through the winter. Flowers in a maritime variety are often much fewer, but not smaller.

The luxuriance of plants growing in a rich soil, and the dwarf stunted character of those crowded in poor soils, are too well known to need particularizing. It is also an everyday observation how gradually the specimens of a species become dwarf and stunted as we advance into the cold damp regions of the summits of high mountain ranges, or into high northern latitudes; and yet it is frequently from the want of attention to these circumstances that numbers of false species have been added to our Enumerations and Floras. Luxuriance entails not only increase of size to the whole plant, or of particular parts, but increase of number in branches, in leaves, or leaflets of a compound leaf; or it may diminish the hairiness of the plant, induce thorns to grow out into branches, etc.

Capsules which, while growing, lie close upon the ground, will often become larger, more succulent, and less readily dehiscent, than those which are not so exposed to the moisture of the soil.

Herbs eaten down by sheep or cattle, or crushed underfoot, or otherwise checked in their growth, or trees or shrubs cut down to the ground, if then exposed to favourable circumstances of soil and climate, will send up luxuriant side shoots, often so different in the form of their leaves, in their ramification and inflorescence, as to be scarcely recognizable for the same species.

Annuals which have germinated in spring and flowered without check, will often be very different in aspect from individuals of the same species, which, having germinated later, are stopped by summer droughts or the approach of winter, and only flower the following season upon a second growth. The latter have often been mistaken for perennials.

Hybrids, or crosses between two distinct species, come under the same category of anomalous specimens from a known cause. Frequent as they are in gardens, where they are artificially produced, they are probably rare in nature, although on this subject there is much diversity of opinion, some believing them to be very frequent, others almost denying their existence. Absolute proof of the origin of a plant found wild, is of course impossible; but it is pretty generally agreed that the following particulars must always co-exist in a *wild hybrid*. It partakes of the characters of its two parents; it is to be found isolated, or almost isolated, in places where the two parents are abundant; if there are two or three, they will generally be dissimilar from each other, one partaking more of one parent, another of the other; it seldom ripens good seed; it will never be found where one of the parents grows alone.

Where two supposed species grow together, intermixed with numerous intermediates bearing good seed, and passing more or less gradually from the one to the other, it may generally be concluded that the whole are mere varieties of one species. The beginner, however, must be very cautious not to

set down a specimen as intermediate between two species, because it appears to be so in some, even the most striking characters, such as stature and foliage. Extreme varieties of one species are connected together by transitions in all their characters, but these transitions are not all observable in the same specimens. The observation of a single intermediate is therefore of little value, unless it be one link in a long series of intermediate forms, and, when met with should lead to the search for the other connecting links.

(2.) *Accidental aberrations from the ordinary type, that is, those of which the cause is unknown.*

These require the more attention, as they may sometimes lead the beginner far astray in his search for the genus, whilst the aberrations above-mentioned, as reducible more or less to general laws, affect chiefly the distinction of species.

Almost all species with coloured flowers are liable to occur occasionally with them all white.

Many may be found even in a wild state with double flowers, that is, with a multiplication of petals.

Plants which have usually conspicuous petals will occasionally appear without any at all, either to the flowers produced at particular seasons, or to all the flowers of individual plants, or the petals may be reduced to narrow slips.

Flowers usually very irregular, may, on certain individuals, lose more or less of their irregularity, or appear in some very different shape. Spurs, for instance, may disappear, or be produced on all instead of one only of the petals.

One part may be occasionally added to, or subtracted from, the usual number of parts in each floral whorl, more especially in regular polypetalous flowers.

Plants usually monoecious or diocious may become occasionally hermaphrodite, or hermaphrodite plants may produce occasionally unisexual flowers by the abortion of the stamens or of the pistils.

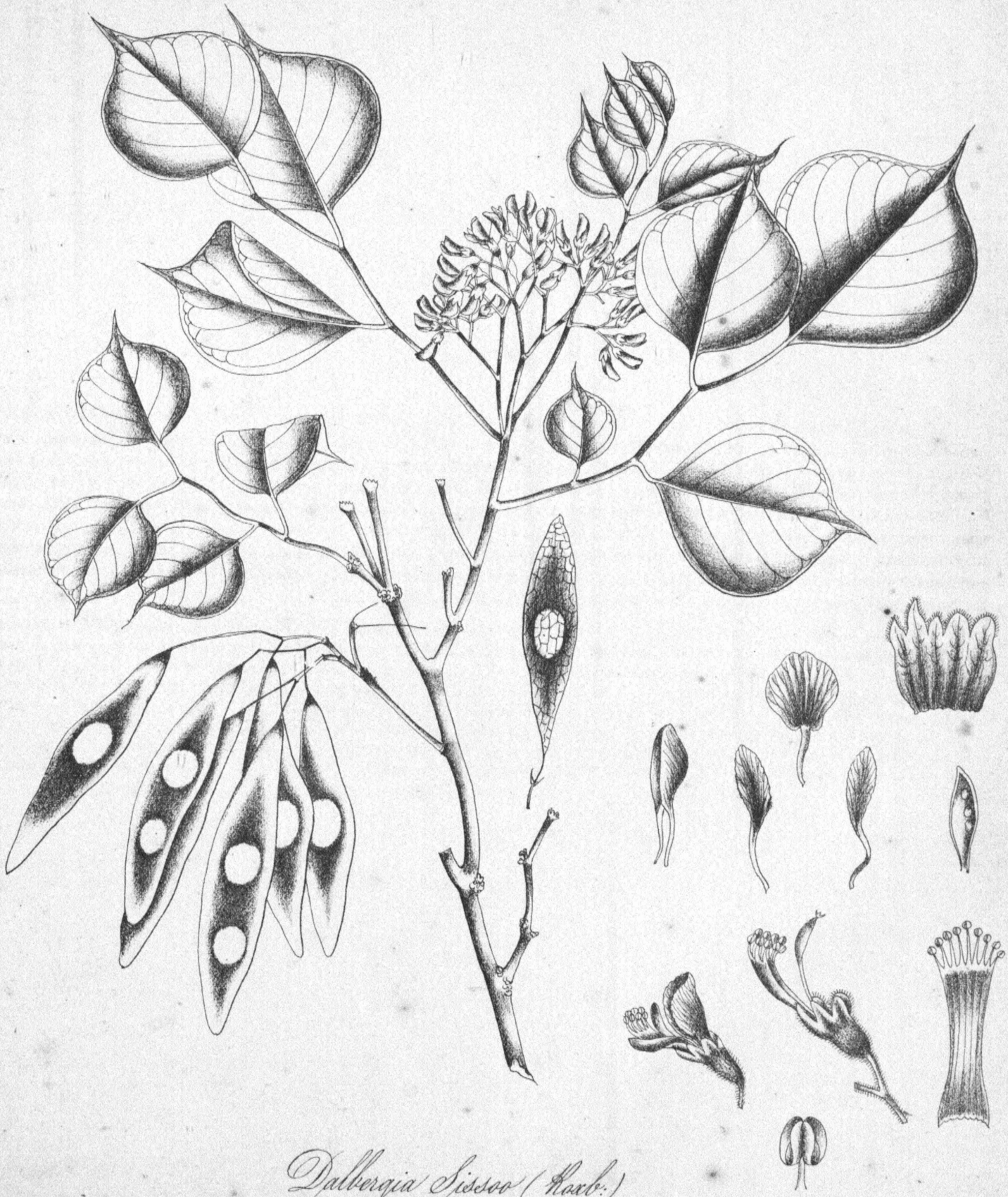
Leaves cut or divided where they are usually entire, variegated or spotted where they are usually of one colour, or the reverse, must also be classed amongst those accidental aberrations which the botanist must always be on his guard against mistaking for specific distinctions

DALBERGIA SISSOO. (Nat. ord. Leguminosæ.)

For Gen. Char. see under "Dalbergia latifolia."

DALBERGIA SISSOO. (Roxb.) Trunk generally more or less crooked, high and of great thickness, branches numerous spreading, bark on young trees ash-colored and pretty smooth, when old deeply cracked and very thick; young shoots downy, leaves alternate pinnate, leaflets alternate 3-5 orbicular or obcordate with a short sudden accumination, slightly waved on the margin; when young pubescent, when old glabrous and shining 1 to 3 inches each way, the inferior ones smaller; petioles round waved, stipules lanceolate caducous; panicles axillary composed of several short subsecund spikes, flowers subsessile small yellowish white, bracts small caducous, calyx pubescent campanulate, segments oblong, two upper ones obtuse, three lower acute with the centre one longest, corol as in the genus; stamens nine, all united into a sheath open on the upper side; style long included in the sheath with the pubescent ovary at the apex on a level with the anthers, stigma large glandular, legume stalked 2-2½ inches long linear-lanceolate membranaceous, 1-3 seeded, seeds compressed reniform. *Roxb. Fl. Ind.* iii. 223;—*W. A. Prod. p.* 264.

A very handsome tree of considerable size, with a trunk up to four feet in diameter; it is abundant in the plains of Central India and at the foot of the Himalayas where it is common in river-beds, but ascends to an elevation of 4,500 *feet; it is cultivated and planted as an avenue tree in the Madras Presidency, and as it grows rapidly in almost any soil, its extended cultivation is desirable. The wood is tolerably light and remarkably strong, in color a light greyish brown with darker colored veins, it yields ship builders in Bengal their crooked timber and knees, and is used for gun carriages and mail carts and furniture; it is called Sissoo, Tàli and Shisham in Hindoostani, and is universally known by the former name. It grows readily from seed, flowers at the beginning of the hot weather, and ripens its seed towards the end of the year, and is said to attain maturity in about* 30 *years. It has a specific gravity of* 724, *a* 6 *feet bar* 2 *inches square, only broke with* 1,104 *lbs. (in Baker's experiments). White ants seldom if ever attack it: a cubic foot weighs* 68 *lbs. green, and* 48 *lbs. dry; the raspings of the wood are officinal, being considered alterative.*



Dalbergia Sissoo (Roxb.)

Govindoo, del.

Dumphy, Lith.

HARDWICKIA BINATA. (Nat. ord. Leguminosæ ; Sub-order Cæsalpinieæ ; Tribe Cynometreæ.)

HARDWICKIA. (Roxb.) *Gen. Pl. p.* 586.—GEN. CHAR. Calycine segments 3-5 petaloid, orbicular or ovate subequal, very much imbricated, scarcely cohering at the base or forming any tube ; corol none, stamens 6-10 distinct inserted into the bottom of the calyx, alternately shorter, anthers small, cells dehiscing longitudinally, ovary sessile free, ovules 2 on the ventral suture close to the apex, style filiform with a large peltate stigma, or slightly winged with a small stigma, legume (in H. binata) lanceolate cuneate, compressed, 2-valved opening at the apex, 1-seeded, seed pendulous in the apex of the legume obovate thin and somewhat membranaceous on the one edge, albumen none, cotyledons thinly carnose, radicle short erect. Trees unarmed, leaves abruptly pinnate 1-3 pair coriaceous, flowers small, racemes axillary panicled, bracts minute.

HARDWICKIA BINATA. (Roxb.) An elegant tree, trunk tolerably straight, bark deeply cracked, branches spreading, leaves alternate petioled, petioles ½ to 1 inch long, leaflets 1 pair opposite sessile with a bristle between them, between semi-cordate and reniform, obtuse, entire very smooth on both sides, 3-6 veined at the base, 1 to 2½ inches long, by about half that in breadth, when young tinged with red, stipules small cordate caducous : panicles terminal and from the exterior axils, flowers pedicelled scattered small, bracts minute caducous, calyx somewhat hoary on the outside often dotted, yellowish within, filaments generally 10, rarely 6-8, anthers with or without an acute point between the lobes, style filiform, stigma large peltate, legume lanceolate 2 to 3 inches long, 2-valved striated lengthways, opening at the apex, seed solitary in the apex of the legume. *Roxb. Fl. Ind.* ii. *p.* 423.

The head-quarters of this valuable tree are the forests on both banks of the Cauvery north of Cauverypoorum, both in the Salem and Coimbatore districts, where it often grows almost to the exclusion of all other trees ; it is also abundant on the slopes of the Balarangams, near Collegal and at Hassanoor and Guzzlehutty, on the Cuddapah and Arcot hills, and the southern parts of the Nully Mallays, and it is also found in the Mysore District on the Circar Mountains, in the Godavery forests and in the Bombay Presidency. It is naturally of straight growth, but cattle being very fond of its leaves, it is pollarded to a frightful extent wherever it grows. It is heart-rending to see the damage done in the Cauvery forests. It is very generally known by its Tamil name "Achà," but is often called Karàchi in the Salem district, and Kàt udagu in some parts ; its Teligoo name is Năr Yepi, and it is called Kamrà in Canarese ; its timber is of a reddish color, very hard, stony, and heavy, and of excellent quality ; it is a first rate building and engineering timber, but is not utilized nearly as much as it might be ; its bark yields a strong fibre much used by the natives in some parts. It grows from the level of the plains up to about 3,500 feet elevation ; it is easily raised from seed, and is cultivated in the Botanical Gardens at Calcutta.

A second supposed species of this genus (Hardwickia pinnata) was discovered many years ago on the Travancore hills, but I have not as yet been fortunate enough to find it ; it has quite similar flowers, but 3 pair of leaflets, and the legume being unknown, it is not certain whether it belongs to this genus.

Govindoo, del.

Dumphy, Lith.

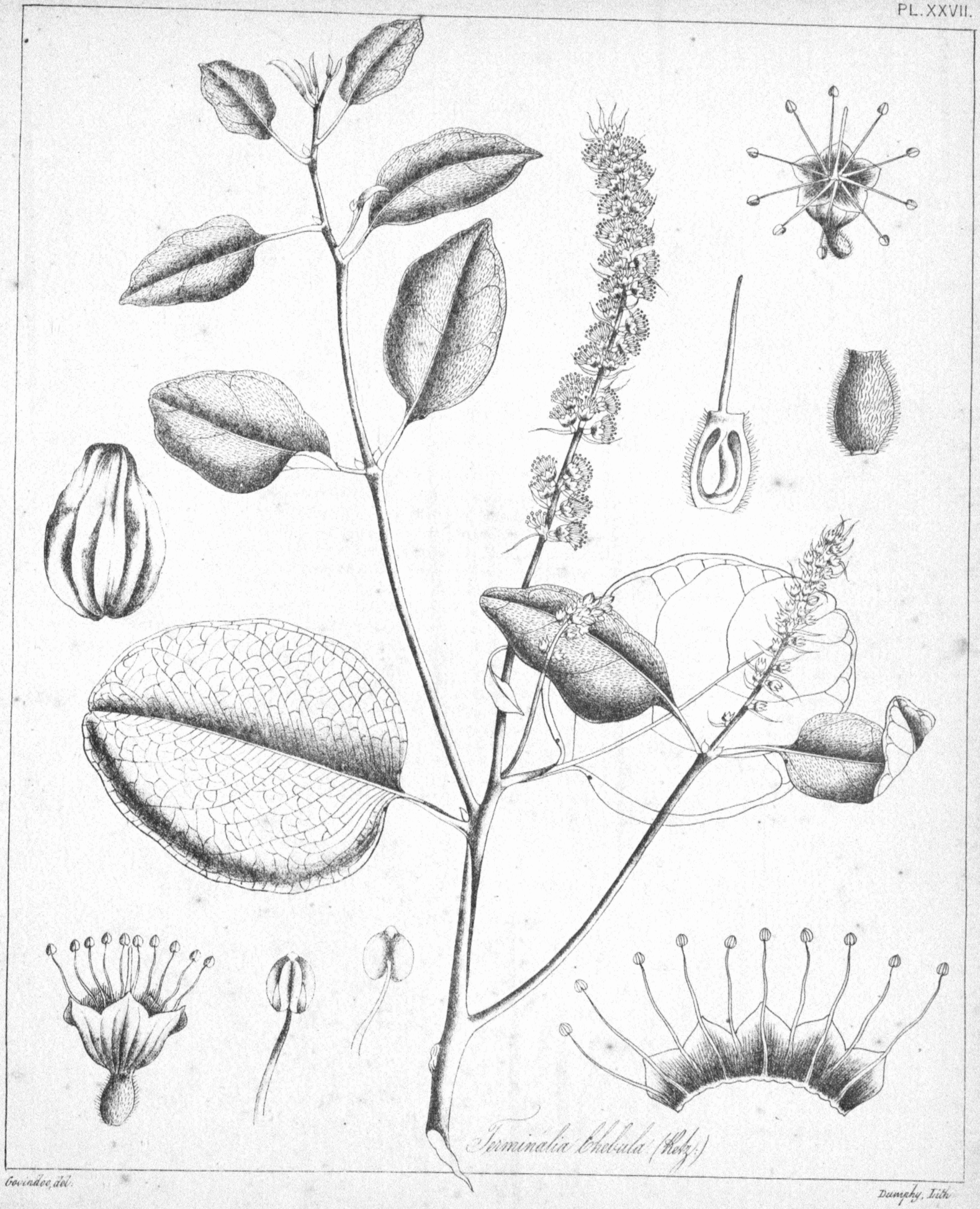
Hardwickia binata (Roxb.)

TERMINALIA CHEBULA. (Nat. ord. Combretaceæ.)

For Gen. Char. see under "Terminalia tomentosa."

TERMINALIA CHEBULA. (Retz.) A large tree, trunk rarely straight, bark ash-colored and cracked; branches numerous spreading, their extremities drooping and downy when young, leaves sub-opposite, shortly petioled ovate or oblong, acute or obtuse at the apex, obtuse or cordate at the base, entire when young clothed especially above with silky hairs, at length glabrous and furnished with one gland on each side of the base of the leaves and occasionally on the apex of the petiole; stipules none, spikes terminal or axillary, often panicled; flowers numerous small dull white, fetid, all hermathrodite, bracts solitary downy subulate 1-flowered, calyx bowl-shaped 5-toothed hairy, particularly on the inside, with five very hairy glands at the bottom surrounding the base of the style; filaments ten alternately a little shorter or equal in length, twice the length of the calyx, anthers small oval; ovary hairy 1-celled, with two ovules attached to the top of the cell, style rather shorter than the stamens, stigma acute, drupe oval about 1½ inches long and about 1 inch in diameter, smooth of a pale greenish yellow very obscurely 5-angled, 1-celled, pulp hard and yellowish, nut oblong thick and very hard with a rough surface and obscurely 5-furrowed, seed solitary lanceolate. *Roxb. Fl. Ind.* ii. *p.* 433;—*Retz. obs.* v. *p.* 31. Myrobalanus chebula, *Gærtn.*;—Melanoxylon cadika-maram, *Koen.*

This large tree is found all over the forests of the Madras Presidency, and is sometimes planted; it is also found in Mysore, Bengal, Bombay, Birmah and Ceylon; it is called Kàdakai in Tamil, Karakà and Karakà Maddi in Teligoo, Hara and Haldà in Hindustani, Heerdà in Canarese, and Araloo gass in Ceylon. The wood is of good quality, and much used for building purposes; the heart wood is yellowish brown, or dark brown, hard and heavy, and makes good furniture, but is cross-grained and difficult to work. In Birmah yokes and canoes are made of it. The tender leaves when scarce unfolded are punctured by an insect, and its eggs deposited therein, which by the extravasation of the sap, become enlarged into hollow glands of various shapes and sizes up to 1 inch in diameter; they are powerfully astringent, and make as good ink as oak galls: they also yield mixed with alum a good durable yellow dye. The fruit is an article of commerce for the large quantity of tannin which it contains. The fruit and gall nuts are both used medicinally by the natives.



Govindoo del.

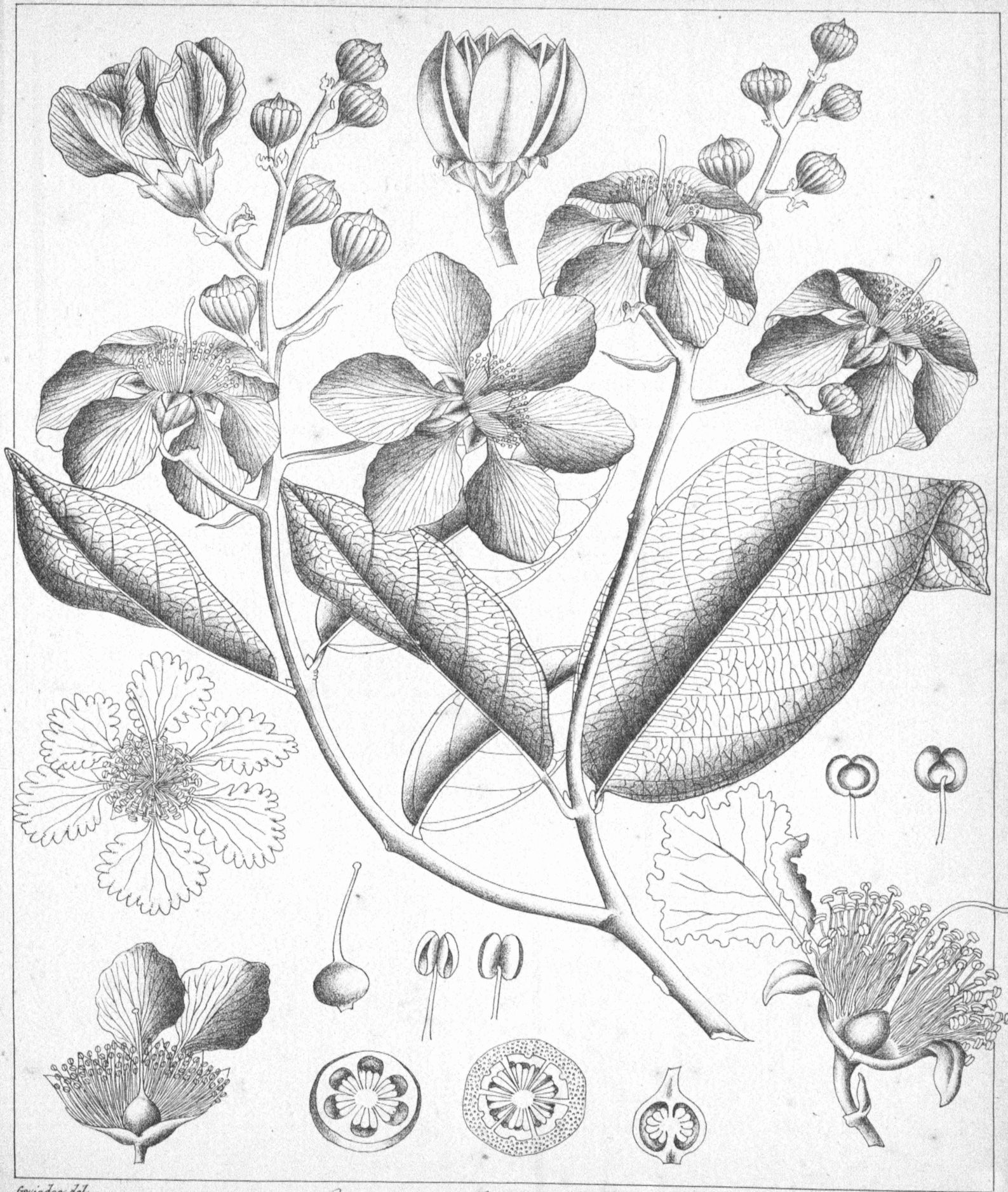
Dumphy, lith.

LAGERSTRÆMIA REGINÆ. (Nat. ord. Lythrarieæ.)

LAGERSTRÆMIA. (Linn.) *Gen. Pl. p.* 783.—GEN. CHAR. Calyx tube turbinato-companulate, lobes six ovate acute, petals six inserted into the jaws of the calyx unguiculate wavy and curled; stamens indefinite inserted into the bottom of the calyx, filaments filiform much exserted equal or six exterior longer, anthers versatile didymous or oblong recurved, ovary sessile included in the tube of the calyx 3-6 celled, style filiform flexuose, stigma capitellate, ovules very numerous, capsule surrounded below by the persistent calyx oblong thickly coriaceous smooth 3-6 celled loculicidally 3-6 valved; seed oblong compressed imbricated expanded into a membranaceous wing, ascending or horizontal, trees or shrubs, branches quadrangular opposite or verticelled, leaves quite entire opposite or the upper ones alternate, panicles axillary or terminal.

LAGERSTRÆMIA REGINÆ. (Roxb.) A good sized tree, leaves oblong glabrous 5-6 inches long by 2½ broad, panicles large terminal calyx tomentose, longitudinally furrowed and plaited, flowers very large rose-purple, petals orbicular waved shortly unguiculate, stamens all about equal, capsules about 1½ inches long 6-celled. *Roxb. Fl. Ind.* ii. *p.* 505.

This very ornamental tree is common in the western forests of the Madras Presidency, most abundant about the foot of the Sisparah ghat and of the Wynad and South Canara ghats; it does not often ascend above an elevation of 2,000 *feet. It is also found in Bengal, Bombay, Birmah and Ceylon; it is called Kadali in Tamil, Jarool in Hindoostani, Challà in Canarese, Adambæ in Malayalum, Taman in Mahratta (Concan), Pyimma in Birmah, and Mooroota in Ceylon. It is largely planted as an ornamental tree on the western coast, and in Madras Gardens and elsewhere. The timber is reddish or sometimes nearly white, tough and very durable under water, though it soon decays under ground; it is much used by the natives for building purposes and in boat making; in the Madras Gun Carriage Manufactory it is used for light and heavy field cheeks, felloes and cart naves, framing and boards of wagons, limbers, and platform carts, and ammunition box boards. In Birmah Dr. Brandis says it is more in use than any other timber except Teak, and is prized for fittings of boats, hulls of canoes, house posts, planking beams, scantling for roofs, carts, and other purposes. In Ceylon it is used for casks and various other purposes. Its root, bark, leaves, and flowers are used medicinally by the natives.*



Govindoo, del.

Lagerstræmia Reginæ (Roxb.)

Dumphy, Lith.

LAGERSTRÆMIA MICROCARPA. (Nat. ord. Lythrarieæ.)

For Gen. Char. see under "L. Reginæ."

LAGERSTRÆMIA MICROCARPA. (Wight.) A large tree, bark smooth and white with the old bark often hanging in thin flakes, leaves elliptic to ovate, often attenuated or acute at the base, and obtusely pointed at the apex, glabrous above, pale beneath, and often very finely downy, 3½ to 4 inches long by 2 inches broad, petioles ⅜ to ½ an inch long, panicles axillary and terminal, glabrous or hoary with minute pubescence, flowers very numerous white, calyx white outside with minute hoary pubescence, or subglabrous, six outer stamens longer than the others, capsule scarcely ½ an inch long. *Wight Icones. pl.* 109.

This tree has often been confounded with L. parviflora Roxb., from which it differs in its numerous panicled flowers and minute capsule, which is not much larger than a pea; the minute downy pubescence on the under surface of the leaves, which has been given as a mark of distinction in L. parviflora, is however often present in this species.

A very handsome tree, abundant in all the western forests of the Madras Presidency, but not met with on the eastern side; it is universally known by its Tamil name of Ventek, and is called Bolandur and Billi nàndi in Canarese, and Veveylà in Tamil; it flowers in the hot weather, and its seed ripens in the rains. Young saplings have their branches very much winged: the wood is light-colored, straight, fibred, and elastic; it is very much used for building purposes flooring rafters, &c., and also in dockyards; if left in the forests exposed it very soon rots, and is rapidly attacked by white ants. It makes capital coffee cases.

Govindoo, del. Dumphy, Lith.

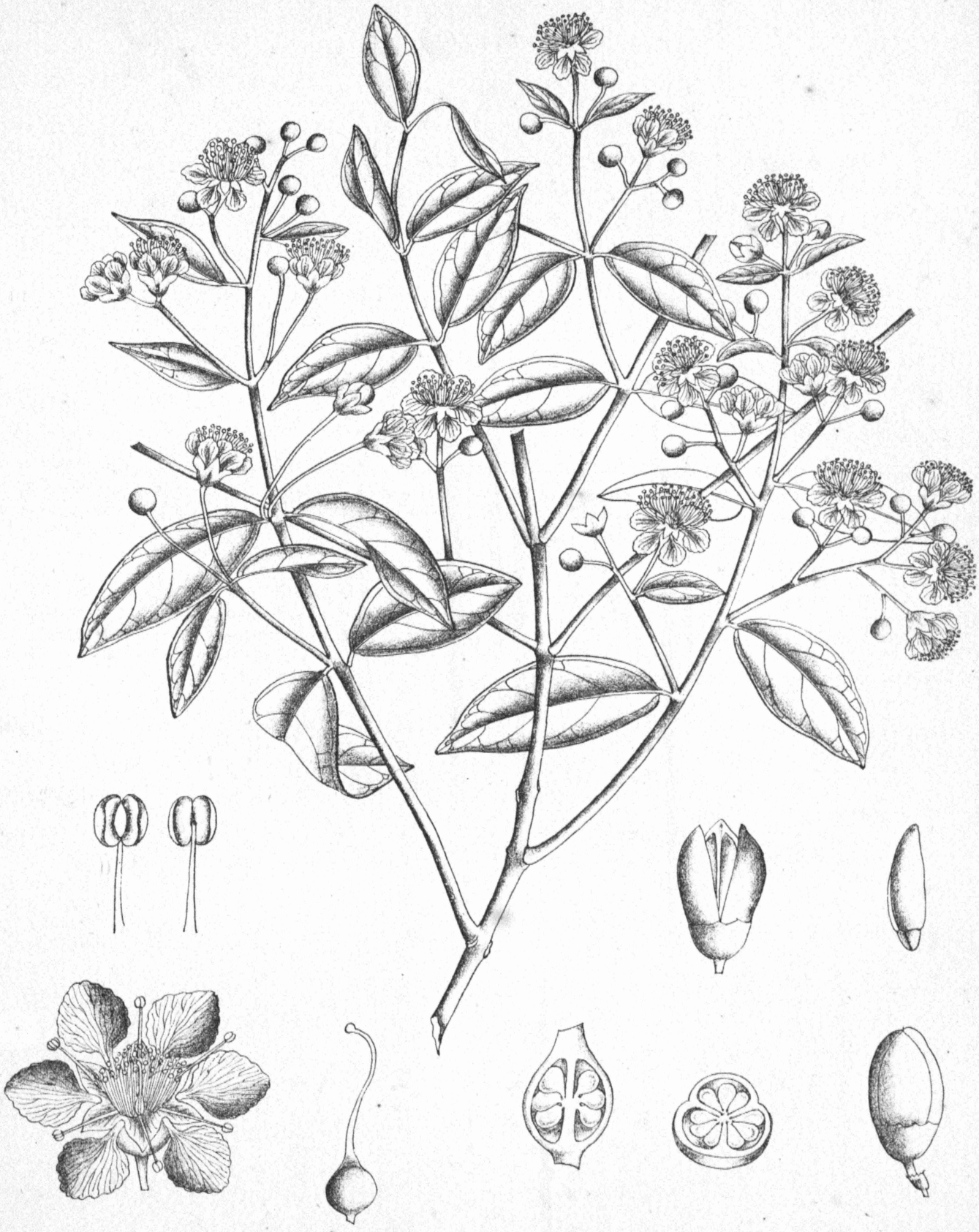
Lagerstræmia microcarpa (Wight.)

LAGERSTRÆMIA PARVIFLORA. (Nat. ord. Lythrarieæ.)

For Gen. Char. see under "L. Reginæ."

LAGERSTRÆMIA PARVIFLORA. (Roxb.) A large tree, bark whitish, leaves oblong oval or ovate acute or obtuse, pale beneath and sometimes minutely downy, glabrous above, 1-2 inches long by ¾ to 1 inch broad, peduncles glabrous axillary as long or longer than the leaves, 3-6 flowered towards the apex, flowers white small, calyx subglabrous not furrowed ; petals shortly unguiculate, six outer stamens longer than the others, capsule oblong a little more than an inch long, very like an acorn, 3-4 celled. *Roxb. Fl. Ind.* ii. 505.

A handsome tree, very common in the Northern Circars and on the Nullay Mallays (Kurnool District), but also met with (though rarely) on the western side of the Presidency, as I have seen trees in the Seegoor forests, found also in Bengal, Bombay, and Birmah, called Chinangi in Teligoo, Naneh and Bondareh in Bombay, and Bàkti, Dhaura or Dhàu in the Bijnoor forests, Tsambelay in Birmah. The wood is whitish or light brown, close-grained, straight, fibred and elastic ; it is much used for building purposes, beams and rafters, and for boat timber, ploughs, axe-handles, &c., and in Meerut it is in great request for buggy shafts.



Govindoo, del. Dumphy, lith.

Lagerstræmia parviflora (Roxb.)

LAGERSTRÆMIA LANCEOLATA. (Nat. ord. Lythrarieæ.)

For Gen. Char. see under "L. Reginæ."

LAGERSTRÆMIA LANCEOLATA. A small tree, leaves oblongo-lanceolate, or elliptic to ovate with a cordate base, smooth on both sides but pale and glaucous beneath, 2½ to 5 inches long by 1¾ to 2 broad, peduncles axillary two in each axil glabrous, as long or longer than the leaves, few flowered at the apex; flowers small white rather larger than in L. microcarpa and parviflora, six outer stamens much longer than the others, capsule as large as in L. Reginæ, 1½ inches long, very hard, 4-celled. *Wall. List.* 2120.

A small ornamental tree, common in the Bombay Presidency, and found in Mysore and at Courtallum, and cultivated in the Lal Bagh gardens at Bangalore. I do not know the timber, but it is probably like its congeners. In the northern part of the Bombay Presidency, it is called Sokutia, in the south Bondara.

Govindoo, del.

Dumphy, lith.

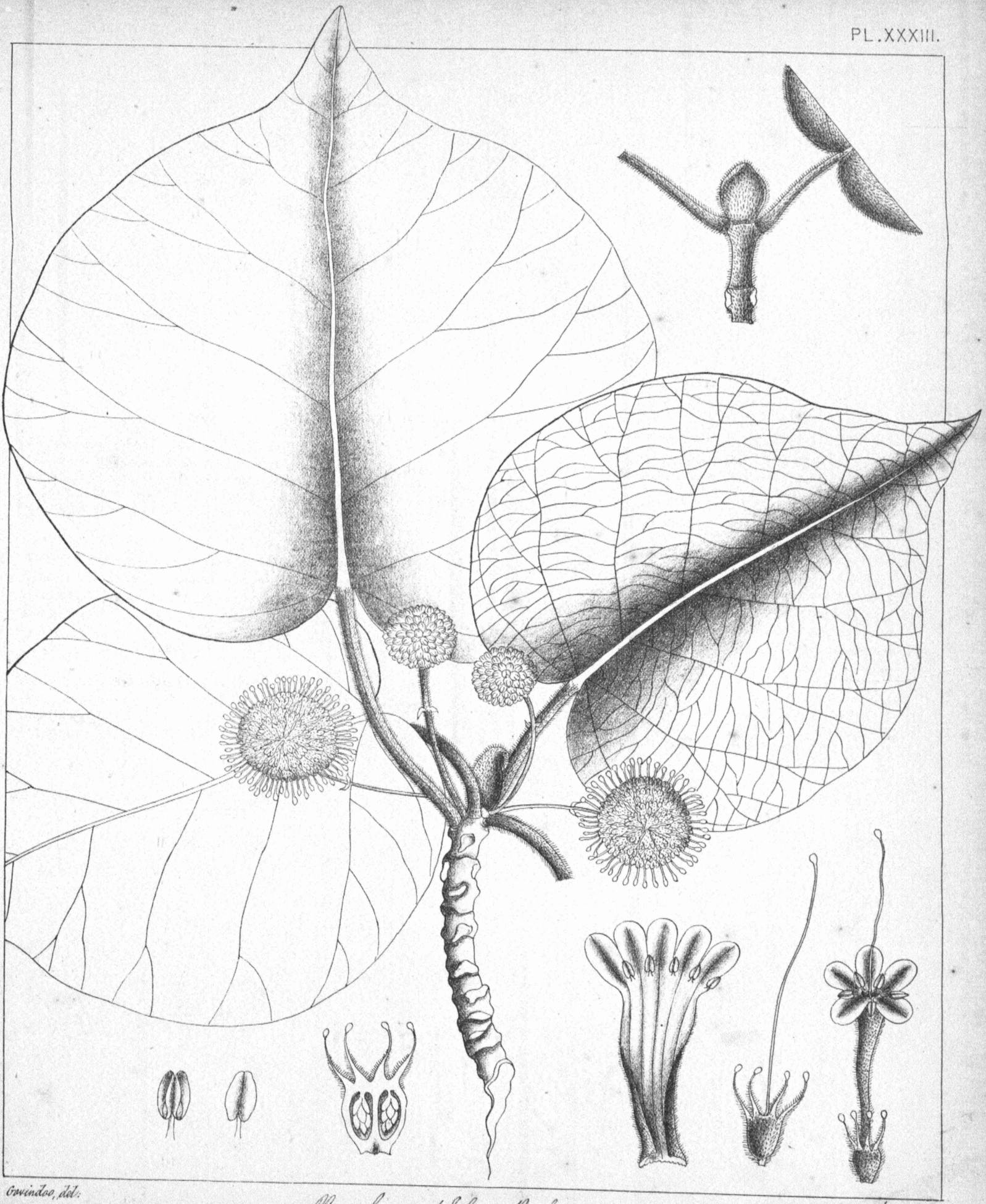
Lagerstræmia lanceolata (Wall.)

NAUCLEA CORDIFOLIA. (Nat. ord. Rubiaceæ.)

NAUCLEA. (Linn.)—GEN. CHAR. Flowers capitate sessile upon a globose receptacle, calyx tube oblong, limb either short or truncated or 5 partite with linear lobes, corol infundibuliform, tube slender with the throat naked, lobes five valvate in æstivation patent oval oblong, anthers either included or protruded shorter than the lobes of corol, style filiform protruded, stigma oblong or ovate terminal undivided, ovary cells two, placenta fixed near the apex of the cells pendulous, capsules 2-celled sessile upon a receptacle not tapering gradually at the base, seeds several imbricated, winged, or with a gland at the hilum, attached to an oblong placenta that is adnate to the dissepiment, embryo inverted in fleshy albumen, unarmed trees, leaves opposite or verticellate, stipules deciduous.

NAUCLEA CORDIFOLIA. (Roxb.) A very large tree, trunk often with buttresses, tolerably straight, bark brownish gray and cracked, branches very numerous, horizontal, forming a very large shady head, leaves opposite petioled, broad cordate pointed entire, above pretty smooth, downy underneath particularly when young, beautifully reticulated with small veins 4-12 inches each way, petioles round a little downy 2-3 inches long, stipules oval caducous, peduncles 1-4 together, axillary round downy 1 to 3 inches long, jointed about two-thirds of the way up and there bearing two small scariose roundish deciduous bracts, calyx segments clavate pubescent, corol pubescent, lobes spreading, anthers slightly protruded, style long, stigma shortly clavate. *Roxb. Fl. Ind.* i. 514.

An immense tree, tolerably common in most of the forests in the Madras Presidency, also in Mysore, Bengal, Bombay, Birmah and Ceylon, called Dudagu and Paspu kadambe in Telugoo, Haldee in Hindustanee, Manja Kadambe in Tamil, Ahnow in South Canara, Hnau in Birmah, and Kolong in Ceylon. The wood is close grained, smooth, fibred, light yellow in color, and is much used for building purposes, planking, &c., furniture chests, gun stocks, combs, &c. It will not stand wet. Dr. Roxburgh says it answers exceedingly well for furniture ; it flowers in June, and the seed ripens at the end of the rains.



Govindoo, del:

Nauclea cordifolia (Roxb:)

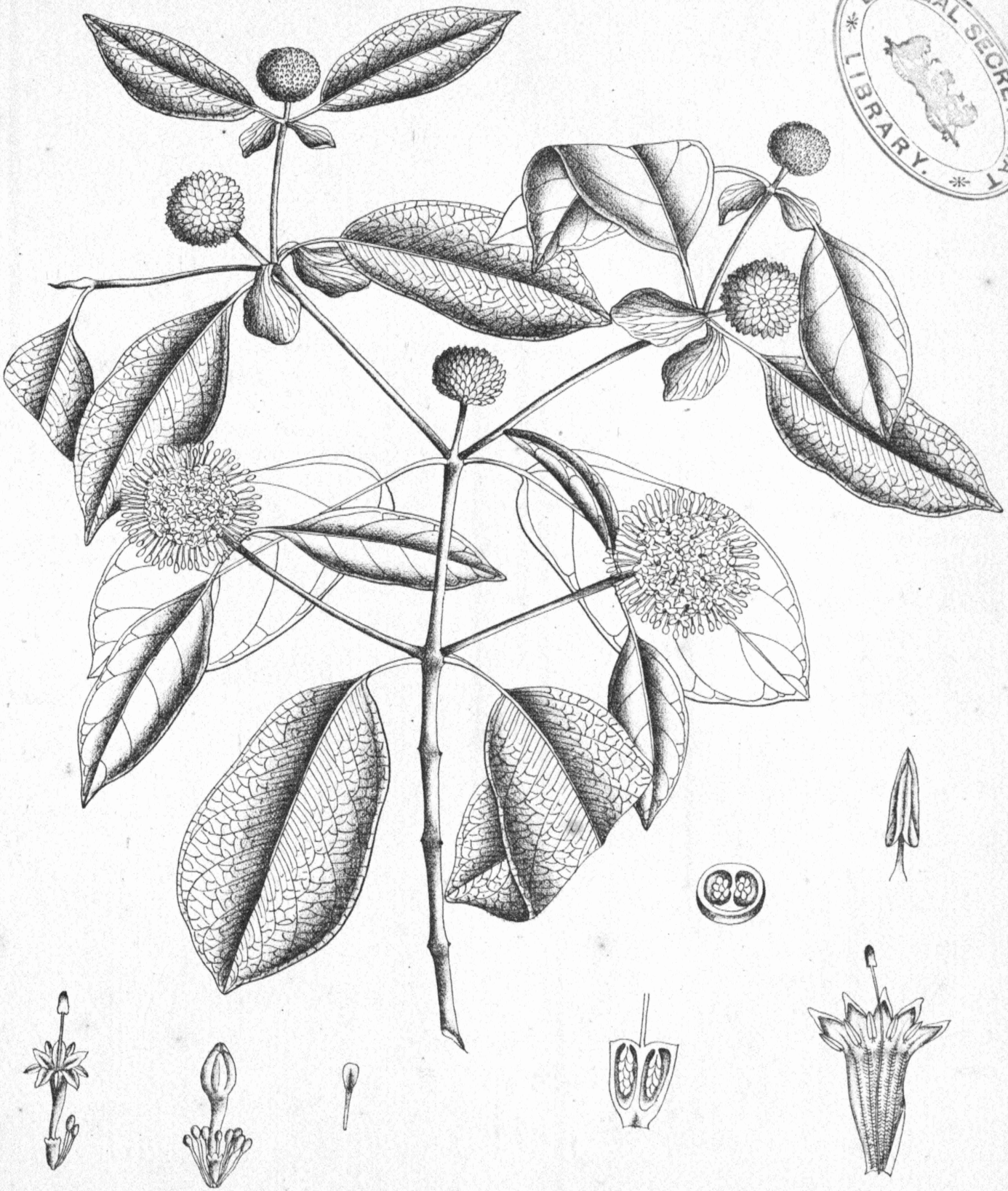
Dumphy, Lith:

NAUCLEA PARVIFOLIA. (Nat. ord. Rubiaceæ.)

For Gen. Char. see under "N. cordifolia."

NAUCLEA PARVIFOLIA. (Roxb.) A large tree, trunk straight, bark brownish gray and crooked, peeling off in irregular patches, branches opposite numerous spreading, forming a large oval shady head; leaves opposite petioled ovate or oval or obovate, obtuse or with a short blunt point, entire, glabrous, except in the axils of the nerves beneath, 2-3 inches long by 1 to 1½ broad, stipules large oval or oblong glutinous caducous, peduncles ternate, the opposite pair often passing into floriferous shoots bearing a pair of small deciduous leaves and jointed near the apex, intermediate or terminal peduncle short usually not jointed, limb of the calyx very short and almost truncated, corol light yellow, tube widening upwards, lobes pointed spreading, anthers pointed shortly protruding, style long, stigma narrow oblong calyptriform, capsules containing two cocci splitting at the inner angle. *Roxb. Fl. Ind.* i. 513 ;—Nauclea parviflora, *Pers. Syn.* i. *p.* 750 ;—Nauclea Orientalis, *Linn.* (*partim*).

This useful tree is common in almost every forest tract throughout the Madras Presidency, and is found in Mysore, Bengal, Bombay, Birmah and Ceylon ; it is called Buta Kadambe in Tamil, Nir Kadambe in Teligoo, Congoo and Hedu in Canarese, Keim and Kangei in Hindustanee, Kadam in Bombay, and Hteim in Birmah. Its wood is light chesnut colored, firm, close-grained, and much in use for building, gun stocks, and various other purposes ; it requires to be kept dry as it soon rots if exposed to wet. The leaves are used as fodder.



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Govindoo, del. Dumphy, Lith.

Nauclea parvifolia (Roxb.)

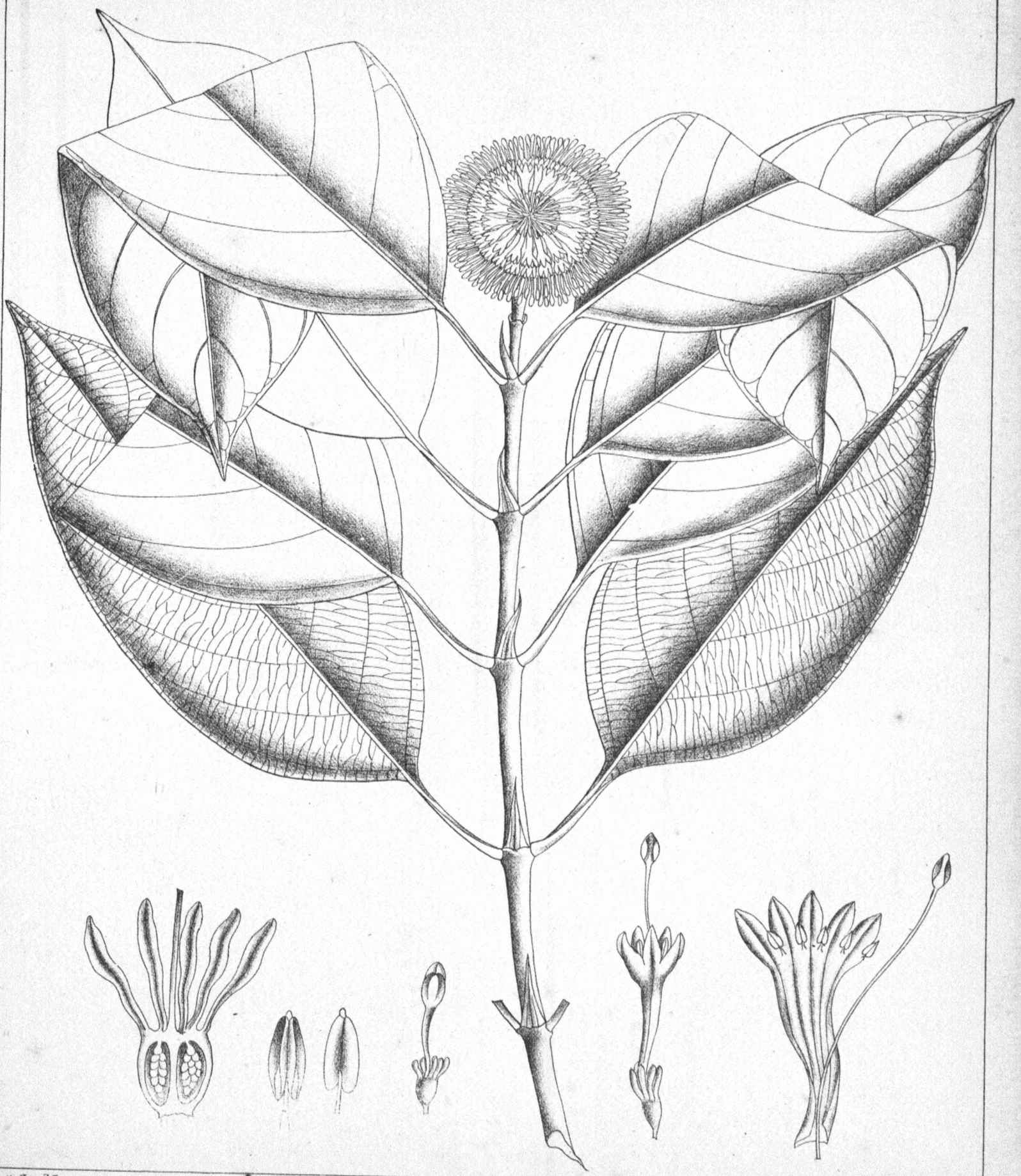
NAUCLEA CADAMBA. (Nat. ord. Rubiaceæ.)

For Gen. Char. see under "N. cordifolia."

NAUCLEA CADAMBA. (Roxb.) A large tree, trunk erect, perfectly straight, bark smooth dark grey, branches numerous horizontal, leaves petioled ovate to oval, smooth entire 5 to 10 inches long, 2-3 inches broad, petioles smooth about 1½ inch long, stipules triangular with a long gradual acumination, peduncles solitary terminal, jointed about half way up, and there furnished with caducous bracts, flowers fragrant in a large orange colored head, with the white clubbed stigmas projecting, calyx with the division spathulate, sometimes two of them shorter than the others, lobes of the corol not recurved, style much elongated, stigma oblong, capsules 4-sided tapering from the apex to the base, near the top it is composed of four distinct hard cells, the lower two-thirds being only 2-celled, seeds numerous very small angular brown colored. *Roxb. Fl. Ind.* i. *p.* 512;—Nauclea Orientalis, *Linn. (partim).*

This handsome tree is common in Bengal, Birmah and Ceylon, and if I am not mistaken in the species, also in the Wynad and Malabar on river banks. The drawing and description are taken entirely from Bengal specimens, as the Malabar tree may be N. parpurea Roxb., if that is distinct from Cadambe; it is called Kadam in Bengal (an universal name for different species of this genus), Hulambe in Ceylon, and Maookadoon in Birmah; the wood is yellow, and is used for building and various other purposes. Dr. Brandis says it is loose grained, but recommended for furniture.

Nauclea elliptica Dalz., from N. and S. Canara, is an allied species, and there are several other species in Bengal and Birmah, some of which it is hoped may be figured in future numbers of this work.



Govindoo, del.

Nauclea Cadamba (Roxb.)

Dumphy, Lith.

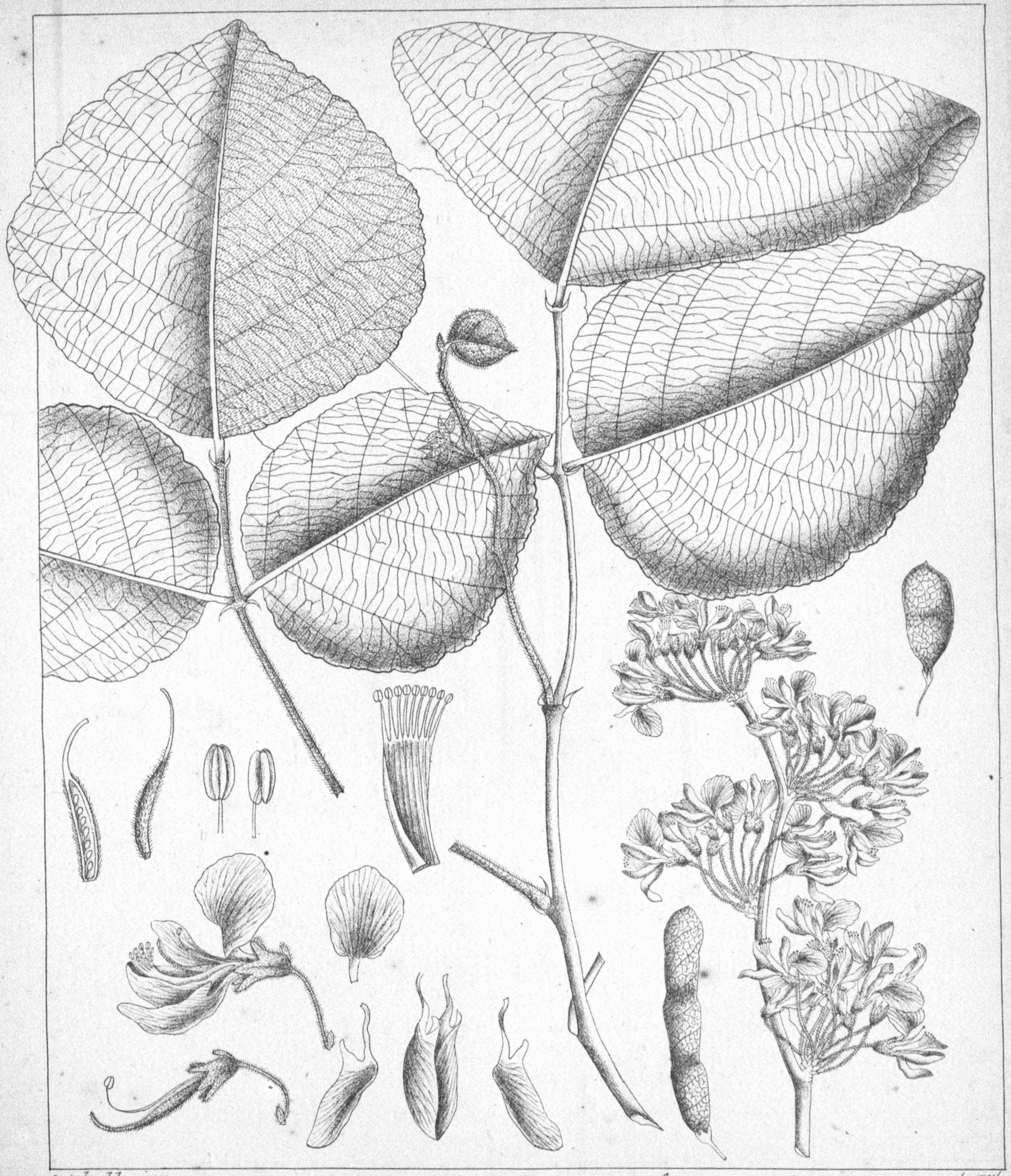
OUGEINIA DALBERGIOIDES. (Nat. ord. Leguminosæ; Sub-order Papilionaceæ; Tribe Hedysareæ.)

OUGEINIA. (Benth.) *Gen. Pl. p.* 518.—GEN. CHAR. Calyx sub-bilabiate, the upper division oblong bidentate, the under one three-parted; disk fleshy at the bottom of the tube; vexillum suborbicular, shortly unguiculate exappendiculate, wings obliquely oblong, keel slightly incurved obtuse about equal to the wings, stamens 10 monadelphous 9 and 1 anthers uniform, ovary sessile many ovuled, style incurved subulate, stigma capitate terminal, legume elongate plane, articulations 1-2 or more oblong, slightly reticulate, scarcely dehiscing, seed compressed reniform. A tree leaves pinnately trifoliate, leaflets large, stipulate, stipules free deciduous, flowers white or rose, in short racemes, bracts small squamæform, bracteoles below the calyx minute persistent.

OUGEINIA DALBERGIOIDES. (Benth.) A good sized tree, trunk tolerably straight, crowned with numerous spreading branches and branchlets, bark dark brown deeply cracked, leaves alternate petioled trifoliate, up to 12 inches long, leaflets the exterior one nearly round with an obtuse point about 7 inches long and 6 broad, the lower pair obliquely ovato-cordate obtuse pointed, 4 inches long, 3 broad, margins of all scolloped and much waved, firm in texture smooth above, a little villous beneath, racemes axillary and terminal, rarely compound; pedicels slender, colored villous, 1-flowered, bracts subreniform small villous caducous, bracteoles small, one at the base of the calyx persistent, flowers numerous rather small white or pale rose fragrant, calyx villous sub-bilabiate as in the genus, corol as in the genus, anthers oblong, affixed by the middle of their back, all uniform; legume linear oblong, obtuse veined articulated, slightly villous, seeds 1-3.—Dalbergia oojeinensis, *Roxb. Fl. Ind.* iii. 221.

A very valuable timber tree, found in the Godavery forests, Jubbulpore, Nagpore, and in different parts of the Bengal (up to 4,000 feet) and Bombay Presidencies, but not observed anywhere to the south. It is cultivated in the Calcutta Botanical Gardens, and in 14 years attained a height of 35 feet. The wood is hard, strong, and very tough, heavy, and close-grained, and not unlike Sissoo, but handsome. It is much valued and is used for building, ploughs, wheels, carriage poles, and various other purposes, and it makes very handsome furniture.

In the North Concan forests a kind of Gum kino is extracted from the bark, which is used by the natives in bowel complaints. It is called Tella Motku in the Godavery forests, Tewas at Jubbulpore and Oude, Sàndan and Sànan in Bignou forests, and Tunnus in Bombay.



Govindoo, del. Dumphy, lith.

Pugeinia dalbergioides (Benth.)

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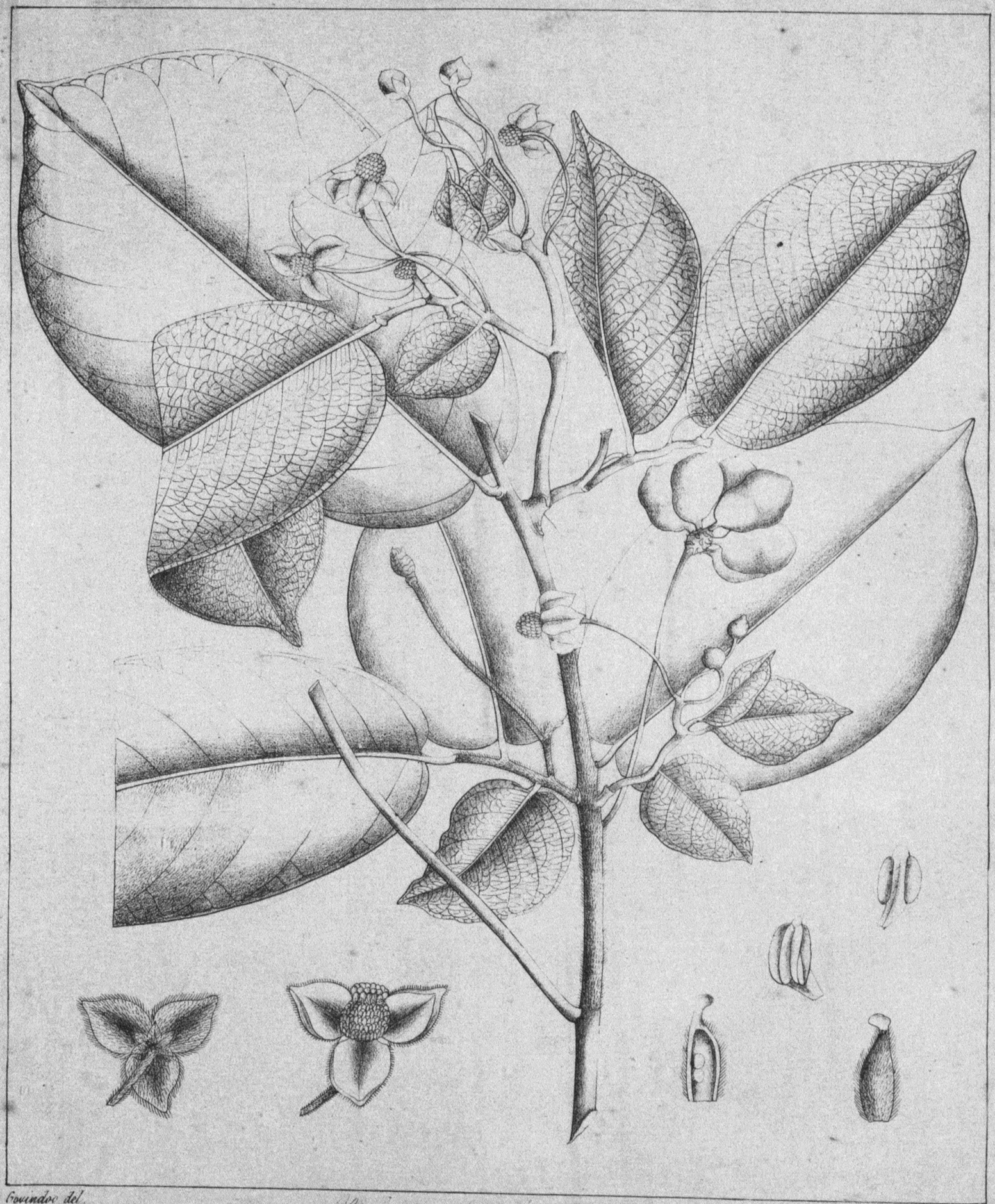
MILIUSA VELUTINA. (Nat. ord. Anonaceæ.)

MILIUSA. (Lesch.) *Gen. Pl. p.* 147.—GEN. CHAR. Flowers dimcious or hermathrodite; sepals 3, minute, petals 6, exterior 3 minute, equalling the sepals, interior 3 much larger slightly coriaceous, æstivation valvate; stamens indefinite, loosely imbricated and inserted on a cylindrical torus surrounding the ovaries; anthers extrorse oval subdidymous 2-celled, connectivum scarcely apiculate; ovaries numerous linear-oblong, style oblong; ovules 1-2 rarely more, inserted on to the ventral suture. Trees or shrubs—(Hyalostemma, *Wall*).

MILIUSA VELUTINA. (Dunal.) A tree, branches densely tomentose, leaves ovate or oblong cordate at the base acute or obtuse at the apex, velvetty-tomentose on both sides, 3-6 inches long, 1¾ to 4 broad, petiole 2-3 lines long; peduncles short, pedicels 3-6 elongate, slender, densely tomentose ebracteate 2-4 inches long, flowers hermathrodite densely tomentose, interior petals broadly ovate, ¼ to ⅓ inch long, densely tomentose outside, within subglabrous and blackish, ovaries downy 2 ovuled, carpels purplish-black puberulous about ½ an inch long on very short pedicels; seeds 1-2.—*H. f. et T. Fl. Ind. p.* 151;—Uvaria velutina. *Dunal Anon.* 91;—U. villosa. *Roxb. Fl. Ind.* ii, *p.* 664.

I have only met with this tree in the Godavery forests and on the Circar mountains; it is also found in Bengal and Bahar, at the foot of the Himalayas, and in Birmah; it yields a strong, yellow wood, which is said not to warp; unseasoned it weighs 62 *to* 65 *lbs. the cubic foot, and* 50 *lbs. when seasoned, and its specific gravity is* ·800. *In the Godavery Districts the natives use it for house building and make cawars of it, and in Birmah it is used for poles of carts, harrows, yokes, spear-shafts and oars; it is called Peddu Chilka dudagu in Teligoo, and Thabookyee in Burmese; it is cultivated in the Botanical Gardens in Calcutta.*



Govindoo del.

Milinsa velutina (Dunal.)

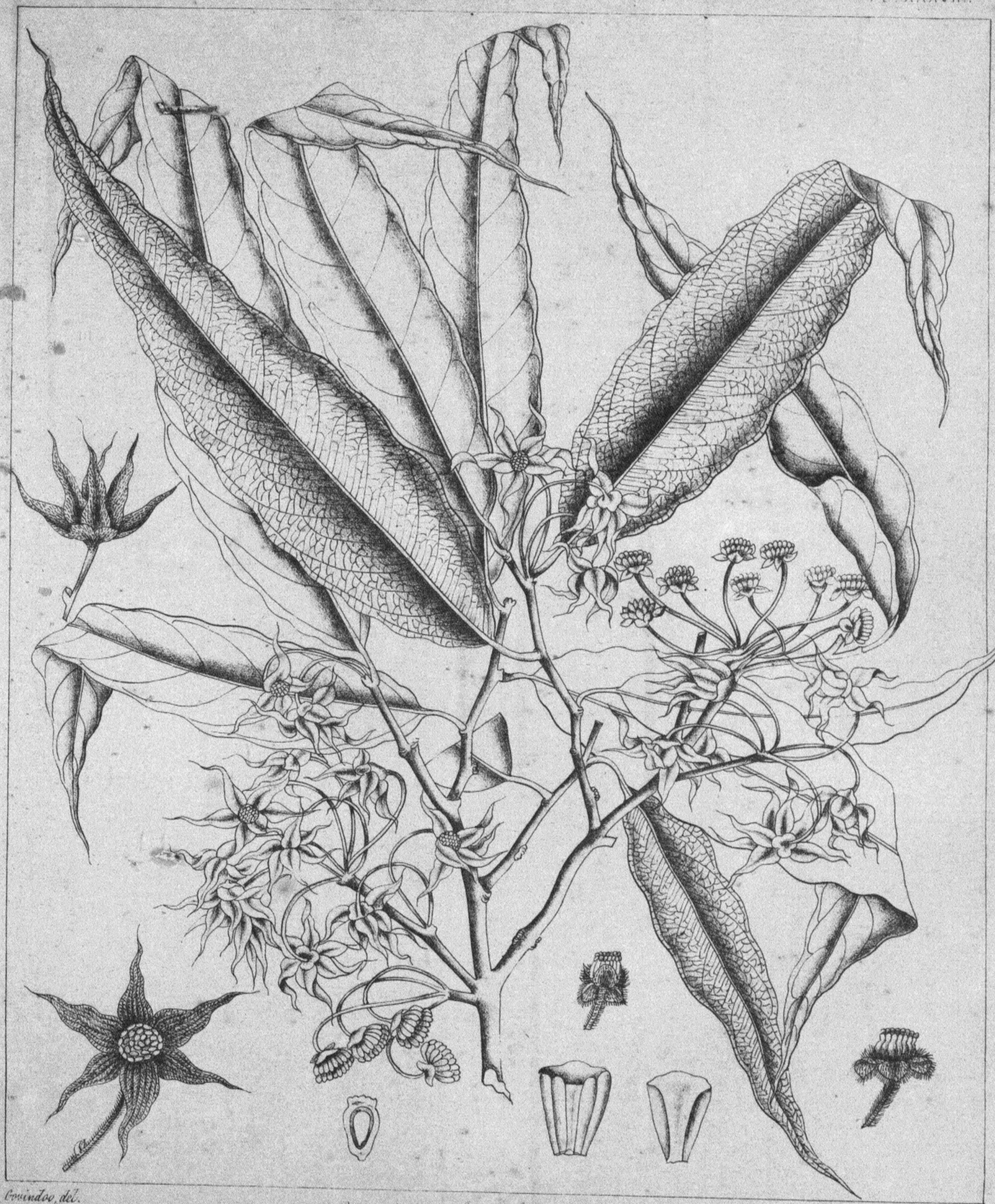
Dumphy, Lith.

POLYALTHIA LONGIFOLIA. (Nat. ord. Anonaceæ.)

POLYALTHIA. (Blume.) *Gen. Pl. p.* 25.—GEN. CHAR. Sepals 3, free or connate below, valvate or slightly imbricate in æstivation; petals 6, equal or sub-equal, valvate in 2 series in æstivation ovate or linear; stamens indefinite linear or cuneate, connective dilated and thickened beyond the cells; carpels indefinite, stigma oblong or capitate, ovules 1-2 usually erect, fruit carpels stipitate globose or oblong, 1 seeded; trees or shrubs, flowers solitary or fascicled axillary or extra-axillary.

POLYALTHIA LONGIFOLIA. (Wall.) A good sized tree, up to 50 feet in height and 6 feet in girth, leaves linear lanceolate acuminate waved on the margin glabrous shining 4 to 6 inches long by 1 to 1½ broad on petioles about ¼ inch long; peduncles long and slender, fascicled along the short lateral leafless shoots; flowers greenish yellow; petals equal, narrow lanceolate acuminate undulated; fruit oblong or ovoid, 1 seeded, purple when ripe. Guatteria longifolia. *W. A. Prod. p.* 10;—*Wall. L. n.* 6,442, Uvaria longifolia. *Roxb. Fl. Ind.* ii, *p.* 664;—Unona longifolia. *Dunal. Dc. Prod.* 1, *p.* 90.

This is a very handsome tree of erect growth and yielding a good shade. It is extensively planted at Madras and elsewhere in the Presidency as an avenue tree and for ornamental purposes. I have never met with it wild, but it is said by Dr. Wight to be indigenous in Tanjore, and it is also wild in the northern part of Ceylon. The timber is seldom used; it is whitish yellow in color, light and very flexible, tolerably close and even grained, and weighs 44 to 48 lbs. the cubic foot when unseasoned, and 37 lbs. when seasoned; and its specific gravity is ·592; *it is used for making drum cylinders. The tree flowers in February, and the seeds ripen in the rains, and the fruit is eaten by birds; it is called Deodàree in Hindustanii, and Assothee in Tamil.*



Govindoo, del.

Polygalithia longifolia (Wall.)

Dumphy, Lith.

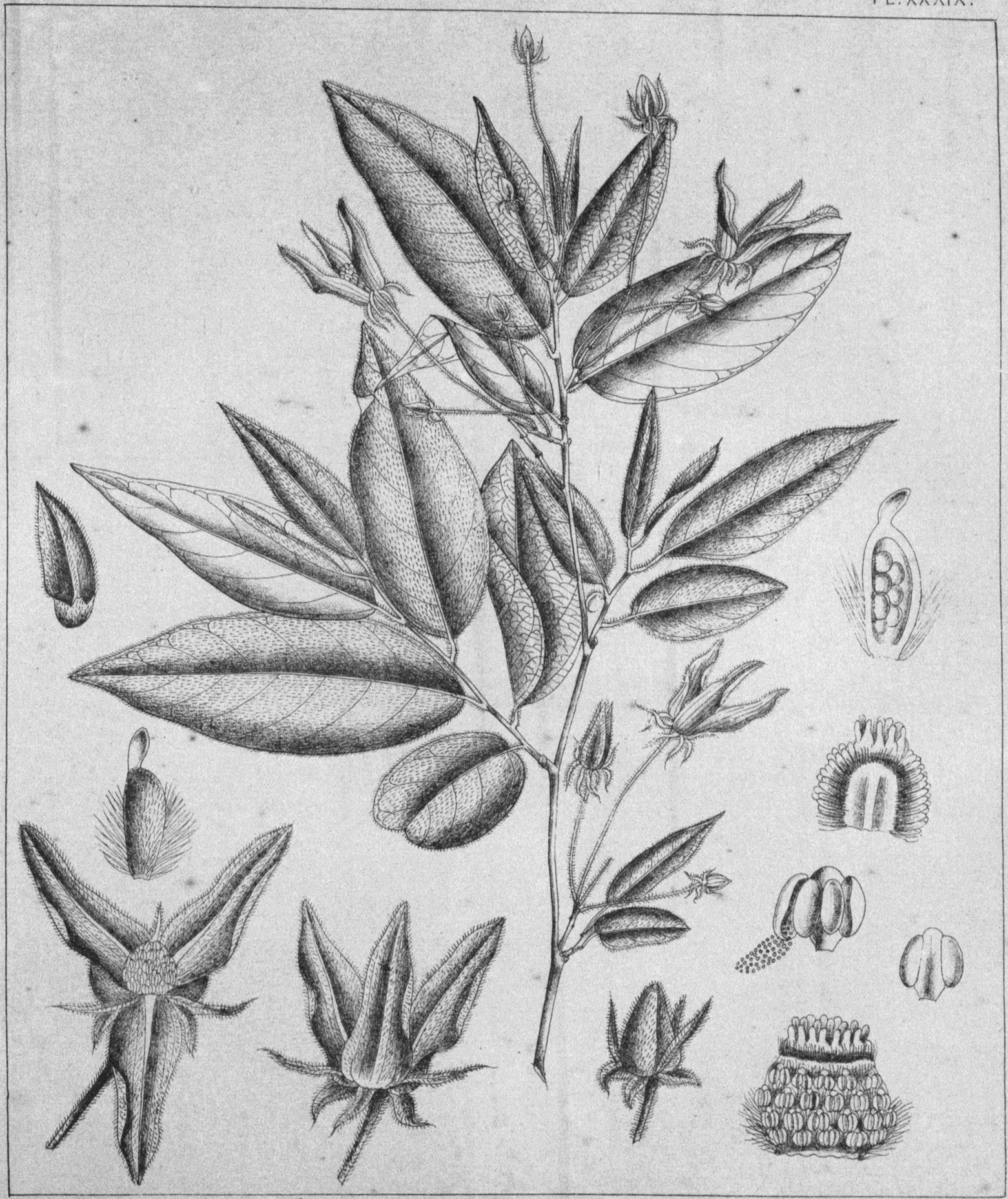
BENGAL SECRETARIAT
LIBRARY.

SACCOPETALUM TOMENTOSUM. (Nat. ord. Anonaceæ.)

SACCOPETALUM. (Bennett.) *Gen. Pl.* 1, *p.* 151.—GEN. CHAR. Sepals 3, small; petals 6, the 3 exterior about the size of the sepals, the 3 interior much larger, cohering together at the margins at length free, saccate at the base; torus subglobose; stamens indefinite in many series; anthers laxly imbricate, subsessile 2-celled; ovaries numerous, ovules in 2 series, 6 or more. Deciduous trees with the flowers appearing before the foliage or with the young leaves.

SACCOPETALUM TOMENTOSUM. (H. f. et T.) A good sized tree, branches rugulose, young ones fulvo-tomentose, leaves oval or ovato-oblong acute pubescent on both sides, rotundate or cordate at the base, thinly coriaceous opaque pale beneath 4-6 inches long 2½-3 broad, petioles ¼ inch long; peduncles 1-2 lines long leaf-opposed 1-2 flowered, pedicels 2-3 inches long slender; sepals linear-oblong 2 lines long; exterior petals longer than the sepals linear, interior petals oblong obtuse puberulous on the outside tomentose within, ¾-1 inch long, torus densely villous; ovaries 4-7 ovuled; carpels 5-15 subglobose 1 inch long, fulvo-tomentose on pedicels about ½ inch long, seeds 3-4 nestling in pulp. *H. f. et T. Fl. Ind.* 1, *p.* 152;—Uvaria tomentosa. *Roxb.* ii, *p.* 667;—*W. A. Prod.* 1, *page* 8.

A tall, handsome tree of very straight growth, not uncommon about the foot of the Ghats on the western side of the Madras Presidency, and also found in the Concan, Bahar, Orissa and Nepal. Nothing is known of the timber.



Govindoo del. Dumphy, Lith.

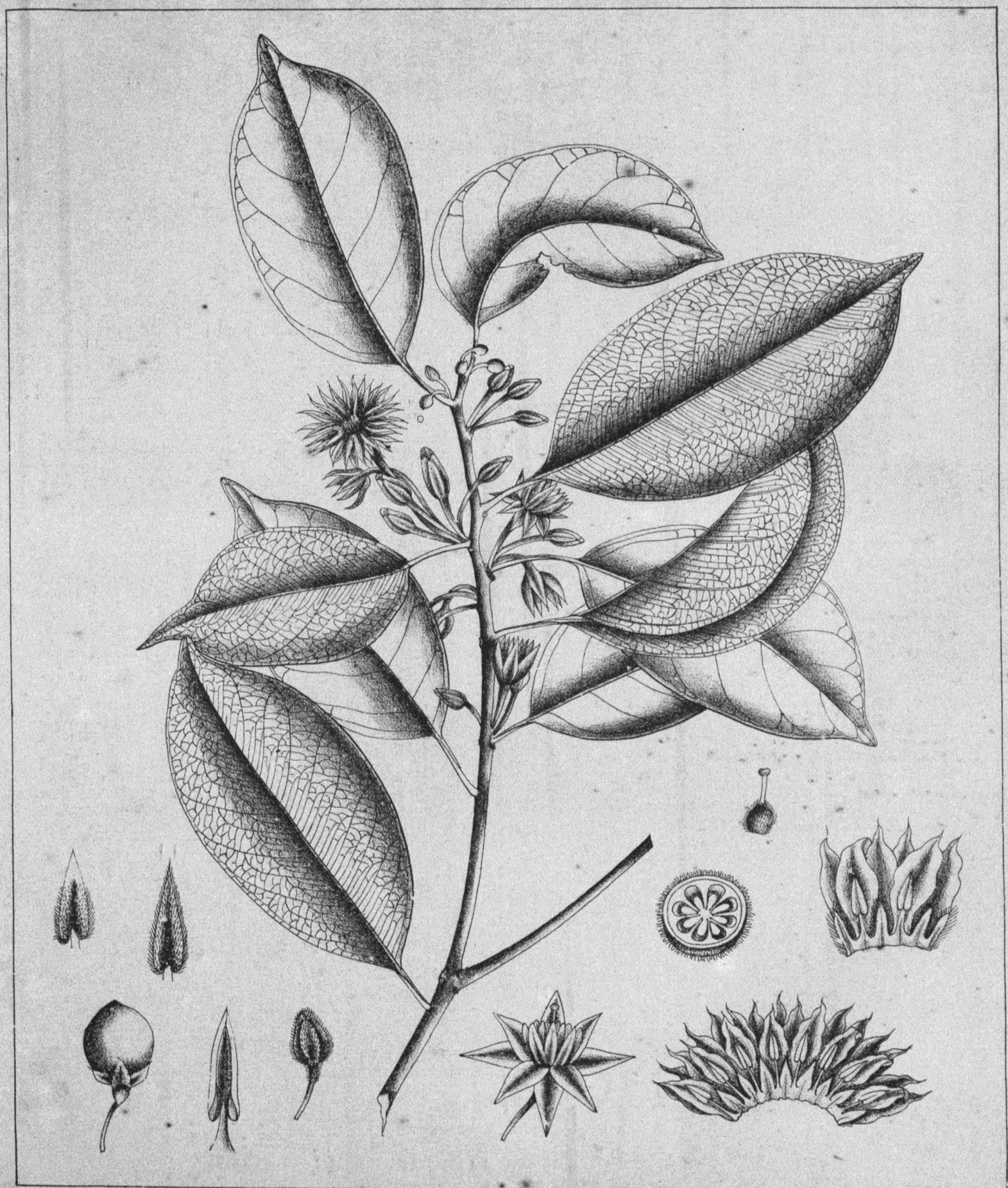
Saccopetalum tomentosum (Hook. fil. et Thom.)

MIMUSOPS ELENGI. (Nat. ord. Sapotaceæ.)

MIMUSOPS. (Linn.) *End. Gen. Pl. p.* 741.—GEN. CHAR. ' Calyx 6-8 parted, divisions in two series, corol hypogynous subrotate, divisions many in two series, 6-16 in the outer, entire or divided spreading, and 6-10 in the inner entire, erect; stamens inserted on to the bottom of the tube of the corol, 6 or 8 fertile alternate with as many sterile ones, anthers sagittate extrorse 2 celled dehiscing longitudinally; ovary 8 celled, ovules solitary in the cells attached to the middle or the lower end of the axis, style subulate, stigma acute; berry by abortion 1-2 seeded, embryo erect, cotyledons large radicle cylindrical inferior.

MIMUSOPS ELENGI. (Willd.) A good sized tree, trunk erect, bark pretty smooth, branches numerous spreading, forming a thick head; leaves alternate short petioled oblong pointed waved smooth and shining and of a deep green color, 3-4 inches long by 1-1½ broad, stipules small lanceolate concave rusty caducous, peduncles axillary 1-8 short clubbed undivided 1 flowered, flowers white fragrant, calyx 8 leaved in a double series, divisions lanceolate, the 4 exterior leathery larger and permanent; corol tube very short, the 16 exterior segments spreading, the 8 interior generally contorted and converging, all are lanceolate and often jagged at the apex, stamens 8 fertile alternate with as many sterile hairy filaments which are sharp pointed or jagged at the apex, fruit oval smooth yellowish and edible. *Roxb. Fl. Ind.* ii, *p.* 236.

This is a very ornamental tree much planted in gardens by Europeans and Natives. It is indigenous in the jungles of the Western Coast, and also in the Circar mountains, Ceylon and Birmah. It grows to about 40 *feet high, with a trunk of about* 12 *feet to the first branches, and a girth of* 5-7 *feet. The timber when unseasoned weighs from* 72 *to* 82 *lbs. per cubic foot, and* 61 *lbs. when seasoned; its specific gravity is* ·976, *it is close and even grained, pinkish to reddish brown in color, and takes a good polish. It is used in house building, cart shafts and for cabinet purposes. The tree is called Mulsari in Hindustanee, Magadam in Tamil, Poghada in Teligoo, Mugali in Canarese, Bukul in Bengali, Elengi in Malayalim, Moonemâl in Ceylon, and Kya-ya in Birmah. The flowers are very fragrant and dromatic, and the Native, distil an odoriferous water from them and use them for garlands, &c. The seeds yield an abundance of oil, which is used by painters; the barks, root and fruit are used medicinally by the natives.*



Govindoo, del.

Dampsy, Lith.

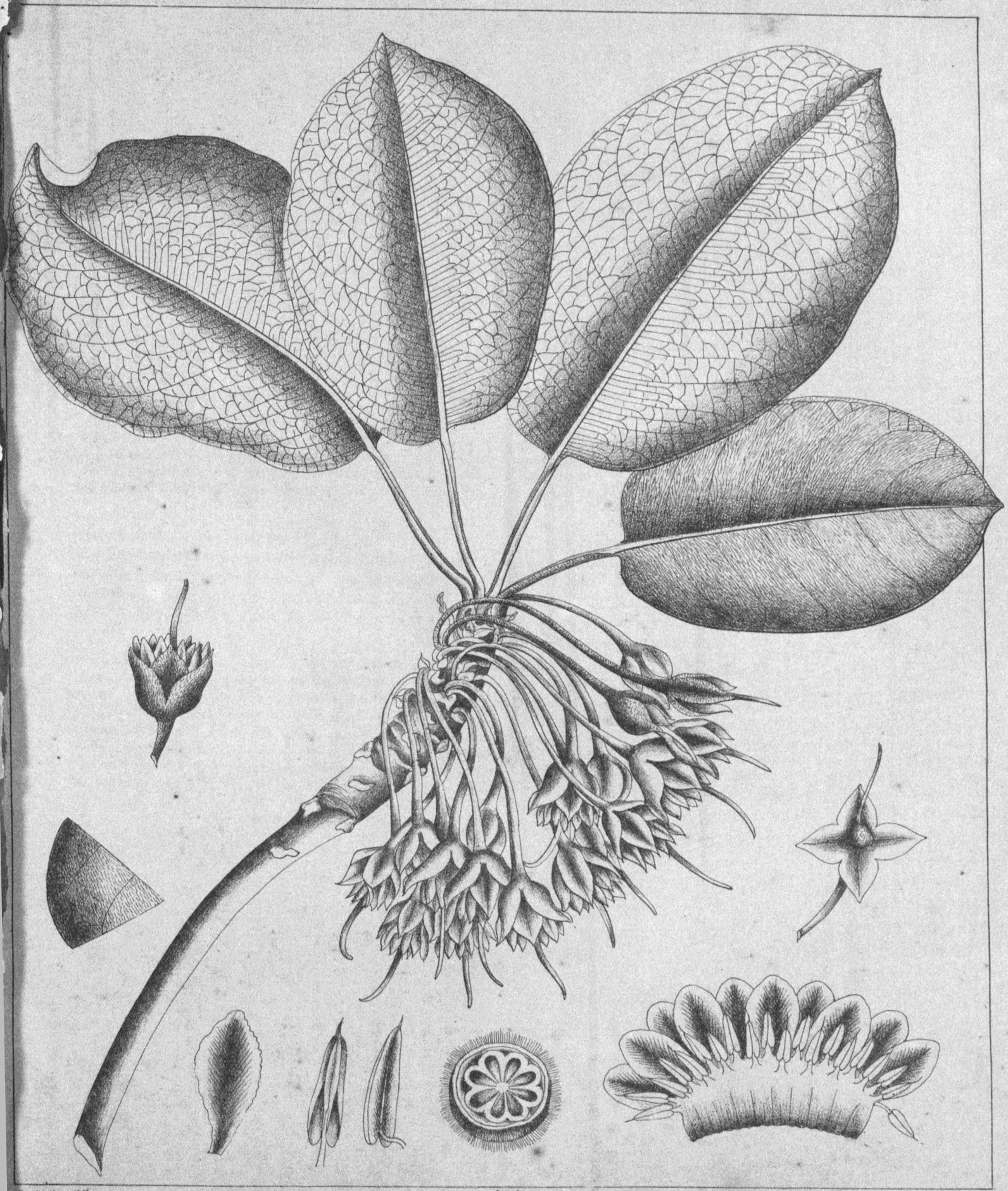
Mimusops Elengi (Willd.)

BASSIA LATIFOLIA. (Nat. ord. Sapotaceæ.)

BASSIA (Linn.) *End. Gen. Pl. p.* 741.—GEN. CHAR. Calyx 4-6 parted divisions in 2 series, corol hypogynous campanulate, limb 5-14 parted erect, stamens inserted on to the inside of the tube twice or thrice as many as the divisions of the corol in 1-3 series, filaments very short, anthers extrorse or introrse, erect subsagittate 2-celled dehiscing longitudinally; ovary 5-8 celled, ovules solitary in the cells erect or pendulous, style simple exserted, stigma acute undivided, berry 4-5 celled, seeds solitary in the cells, embryo exalbuminous, cotyledons fleshy. Trees, leaves alternate entire, peduncles axillary one flowered.

BASSIA LATIFOLIA. (Willd.) A good sized tree, trunk straight but short, covered with smooth ash-colored bark, branches numerous, the lower ones spreading horizontally, leaves alternate petioled crowded about the extremities of the branches oblong rigid smooth above, somewhat whitish below, 4-8 inches long, 2-4 broad, petioles round, about an inch long, stipules subulate downy; flowers numerous crowded from the extremities of the branchlets on peduncles about one inch long, at all times bent downwards, calyx 4 leaved, corol limb 7-14 parted, ovary hairy 6-8 celled with one seed in each cell attached to the upper part of the axis, berry the size of a small apple; seeds 1-4, very rarely more. *Roxb. Fl. Ind.* ii. *p.* 526.

This tree is found all over the Presidency, and in Bengal, Bombay, and Mysore, but more often in a cultivated state than wild; it attains a height of 50 *feet and a girth of* 12 *feet, it does not ascend to any great elevation; the timber is hard, strong and durable, not easily worked, close, even grained and of a reddish brown color. A cubic foot unseasoned weighs* 77 *to* 80 *lbs., and* 66 *lbs. when seasoned; its specific gravity is* 1·056. *It is used for the naves of wheels, framing and pannelling of doors, windows and furniture, and for country vessels; it is soon attacked by white ants. The tree is called Mohwa in Hindustanee, Kât Illipi in Tamil, and Ippi in Teligoo; it flowers in the hot season, and the flowers are sweet tasted and are eaten raw by the natives, and deer and jackals are very fond of them. An ardent spirit, not unlike whisky, is distilled from them in many parts of the country. The seeds yield by expression a large quantity of oil, which concretes immediately it is expressed, and retains its consistency at a temperature of* 95°. *It is coarse but used by the poorer classes in lamps, for the adulteration of ghee, and for frying cakes, and is used for making soap.*



Govindoo, del. Dumphy, Lith.

Bassia latifolia (Willd.)

BASSIA LONGIFOLIA. (Nat. ord. Sapotaceæ.)

For Gen. Char. see under "Bassia latifolia."

BASSIA LONGIFOLIA. (Linn.) A good sized tree, trunk pretty straight but short, branches numerous, dividing much and spreading, forming a shady head, young shoots downy ; leaves crowded, about the ends of the branchlets lanceolate entire smooth 4-7 inches long by 1-1½ broad, petioles 1-2 inches long round slightly villous, stipules ensiform downy very early caducous, peduncles crowded round the base of the young shoots 2-3 inches long drooping 1 flowered ; calyx divisions 4 acute, corol tube length of the calyx gibbous thick and fleshy, limb 8-10 cleft segments sublanceolate, anthers 16-20 in 2 rows, one above the other attached to the inside of the tube, filaments scarcely any, ovary 6-8 celled with one ovule in each cell attached to nearly the top of the axis ; style twice as long as the corol, stigma minute, contracted ; berry oblong, size of a plum, villous pulpy when ripe yellowish. *Roxb. Fl. Ind.* ii. *p.* 523.

This is a common tree throughout the Madras Presidency, Mysore, Bombay, Bengal and Ceylon, but not found at any great elevation ; it is very much cultivated in topes and elsewhere on account of its oil. It attains to 50 feet in height and a maximum girth of about 6 feet, the timber is heavy, close and straight-grained, very flexible and durable, scarcely inferior to Teak in strength, and of a yellowish brown color. A cubic foot unseasoned weighs 70 to 75 lbs. and when seasoned 60 lbs. Its specific gravity is ·960; it is valued for keels of ships and for planking below the water line and makes good trenails, it is also used in the construction of carts when great strength is required, and for furniture, and in Ceylon for bridges. The oil pressed from the ripe fruit is used by the poorer natives as lamp-oil, and for cooking purposes, and cakes are made of it, and it is also used medicinally. The gummy juice which abounds in the bark and young fruit is also used medicinally as are the leaves and bark, and the oil is used in making soap in India, and in the manufacture of candles in England. Its price is about 3½ Rs. per maund. The tree flowers in the hot weather, and the flowers are dried in the sun and roasted and eaten by the poorer classes, they are also eaten by animals and birds. I have an allied species from South Canara (banks of rivers), which is called Nànil, in character it is intermediate between this species and elliptica.

Govindoo, del. Dumphy, lith.

Bassia longifolia (Linn.)

BASSIA ELLIPTICA. (Nat. ord. Sapotaceæ.)

For Gen. Char. see under "Bassia latifolia."

BASSIA ELLIPTICA. (Dalzell.) A very large tree, bark rusty, leaves fascicled at the ends of the branches, somewhat coriaceous dark green above, paler beneath, entire long petioled oblong obovate tapering at the base, terminated in a sudden and blunt acumination, venation indistinct above but marked beneath, peduncles axillary 1-3, 3-4 times longer than the petiole, in fruit erect; calyx 6-parted, in 2 series, 3 outer divisions broader and larger than the 3 inner and more leathery; corol 5-6 cleft contorted in æstivation deciduous, hairy on the inside of the tube at the insertion of the stamens; stamens 12-18, inserted on the inside of the tube shorter than the corol sessile extrorse 2 celled, alternate in 2 rows but the apex of all the anthers reach the same level; ovary tomentose 6 celled, cells 1 ovuled, ovules attached to a basal placenta, style nearly three times as long as the ovary, stigma simple, fruit oblong, size of a large almond 1 seeded by abortion, seed erect, exalbuminous cotyledons fleshy. *Dalz. in Hook. Journ. of Bot.* iii. *p.* 36;—Isonandra acuminata. *Cleghorn in Memorandum on the Pauchotee or Indian gutta tree.*

A gigantic tree, 100 *feet high and up to* 12 *feet in girth, common in all the moist sholas of the Western Ghats of the Madras Presidency, up to* 3,500 *or* 4,000 *feet, and in similar localities on the Bombay Ghats; the timber is hard and not unlike Sál in its grain, and takes a good polish. It is much employed by planters for building purposes, and might be used for furniture. A sort of gutta exudes from the trunk, which is known as pàlà gum or Indian gutta percha. It is not of any value compared with the true gutta percha, but might be used as a birdlime or a cement, and perhaps for encasing telegraph wires. The tree is known by the native names of Pàlà and Pauchotee.*

Govindoo, del. Dumphy, Lith.

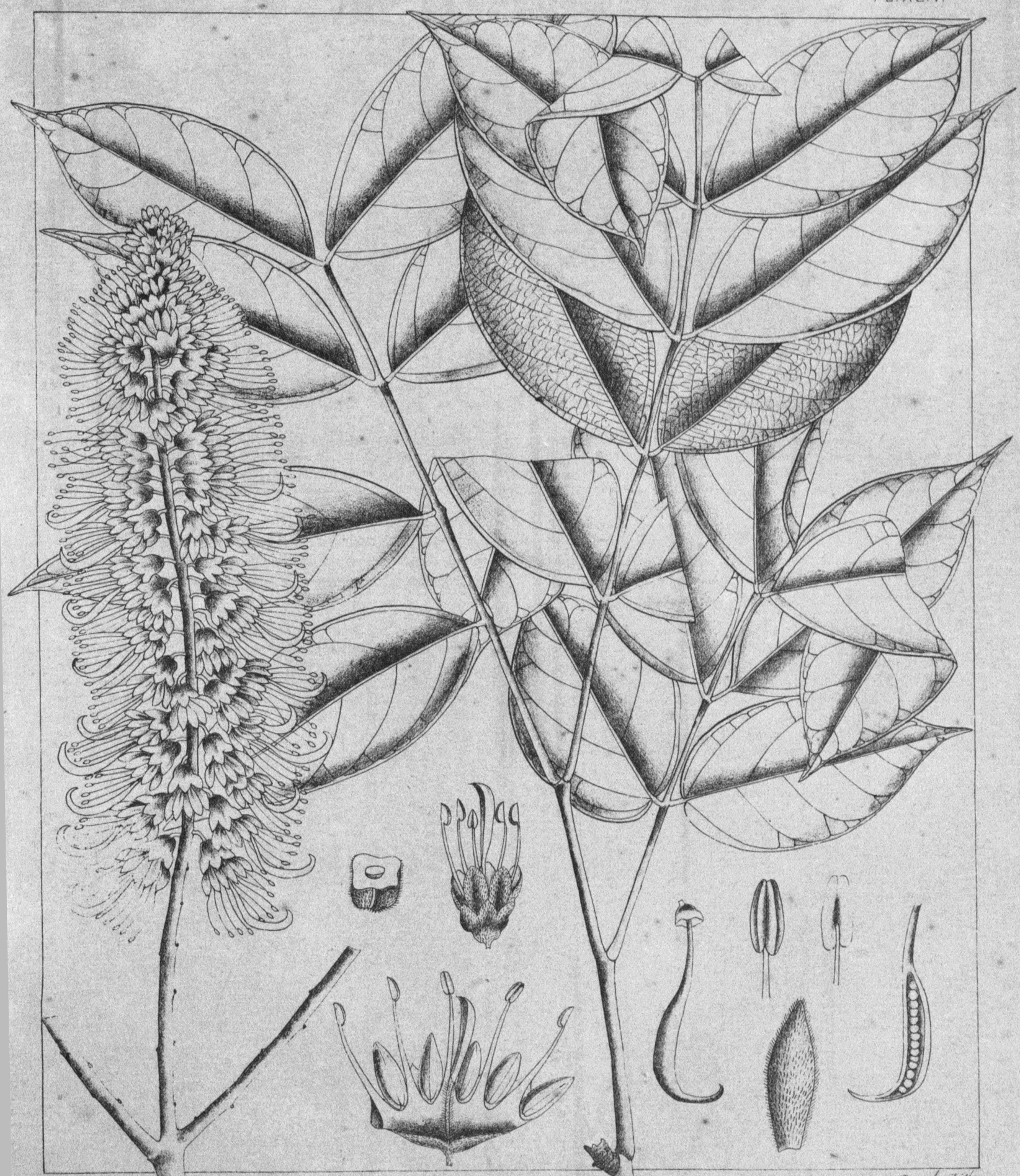
Bassia elliptica (Dalz.)

ACROCARPUS FRAXINIFOLIUS. (Nat. ord. Leguminosæ ; Sub-ord. Cæsalpinieæ ; Tribe Eucæsalpinieæ.)

ACROCARPUS. (Wight.) *Gen. Pl.* 1, *p.* 568.—Calyx tube campanulate, lobes 5 short lanceolate, petals 5 narrow subequal subcoriaceous, subimbricate, inserted on to the mouth of the calyx and alternate with its shorter lobes ; stamens 5 free alternate with the petals, filaments broad at the base subulate elongate, anthers oblong linear versatile, cells dehiscing longitudinally ; ovary stipitate, stipe free, many ovuled, style short inflexed, stigma small terminal, legume unknown. An unarmed tree, leaves very large bipinnate, leaflets ovate acuminate herbaceous, racemes axillary solitary or 2-3 at the apex of the branches.—*Wight's Icones Pl.* 254.

ACROCARPUS FRAXINIFOLIUS. (Wight.) An immense deciduous tree, often with very large buttresses, bark light grey colored, young parts aureo-pubescent, leaves glabrous bipinnate, pinnæ 3 pairs with a terminal pinnæ, leaflets equally pinnate 4-6 opposite pair ovate acuminate herbaceous 3-3½ inches long by 1½ broad, racemes many flowered, flowers dull greenish red, calyx and corol minutely aureo-pubescent on the outside.

One of the largest and loftiest trees in our Presidency, generally of very straight growth, with large buttresses at the base. It is very general about the western forests, as I have observed it on the Tinnevelly and Travancore Hills, on the Anamallays, Nilgiris, Wynad, and in Coorg and South Canara. It ascends from the plains up to nearly 4,000 *feet. I have measured a tree* 27 *feet in girth above the buttresses : the flowers appear in December or January with the young leaves, or when the tree is quite destitute of foliage, but I have never yet been able to procure the legume or seed. The timber is flesh colored and shrinks in seasoning ; it is light and much resembles that of the Cedrela toona, and has a cedelaceous smell ; it is much used by the planters at Coonoor and in the Wynad for building purposes, furniture, &c., and in Coorg it is largely used for shingles. It is known to planters by the names of shingle tree, pink cedar, and red cedar, and is called Mallay kone in Tinnevelly, and Kilingi by the Burghers on the Nilgiris ; it is of rapid growth, and well worthy of cultivation by the Forest Department.*



Gowindoo del. Dumphy Lith.

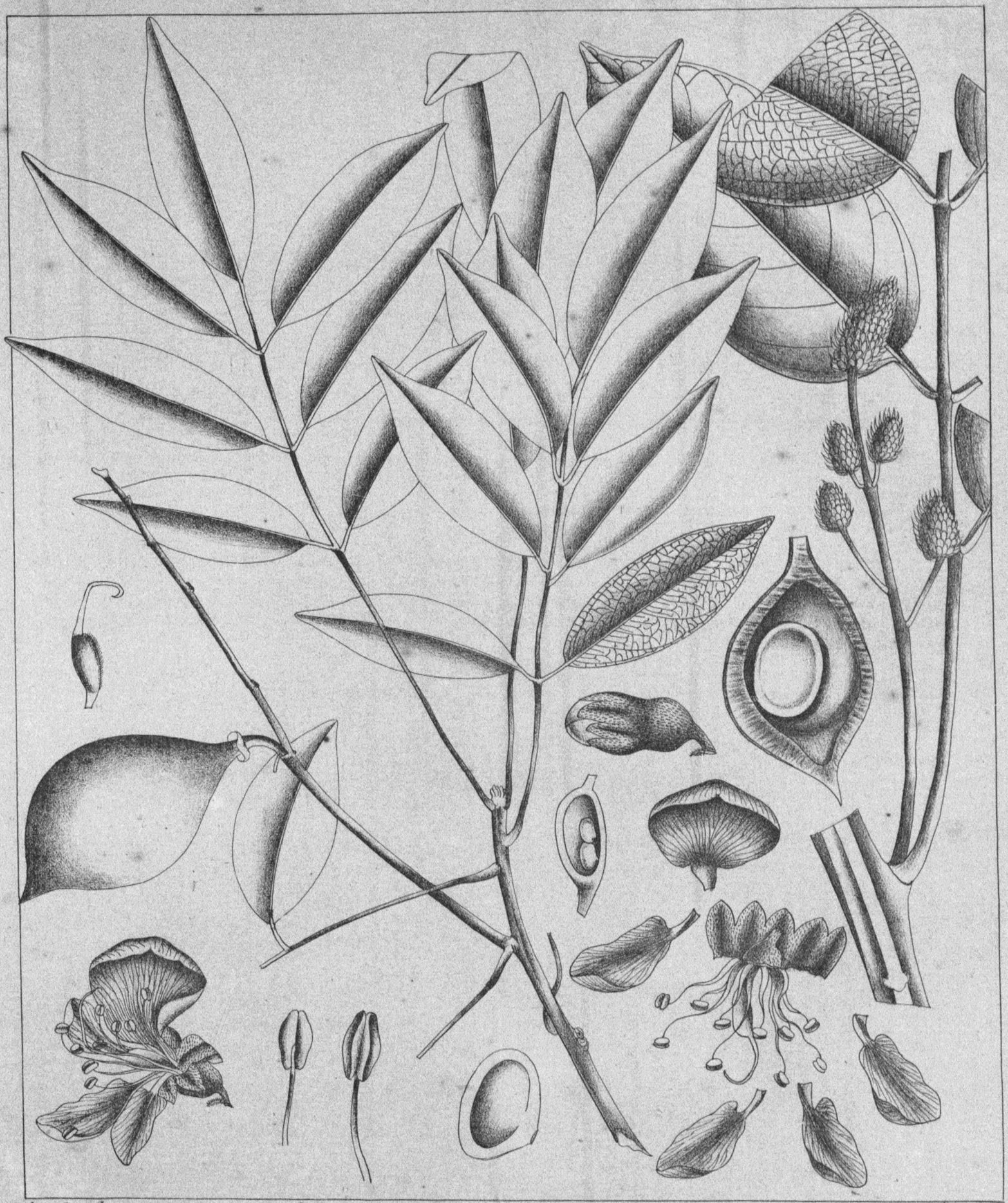
Acrocarpus fraxinifolius (Wight.)

ORMOSIA TRAVANCORICA. (Nat. ord. Leguminosæ ; Sub-ord. Papilionaceæ ; Tribe Sophoreæ.)

ORMOSIA. (Jacks.) *Gen. Pl.* 1, *p.* 556.—Calyx campanulate 5 cleft, or the 2 upper lobes often united into one, standard broad, keel petals not longer free, stamens free, often very unequal, and one sometimes without any anther, ovary sessile or nearly so, with two or few ovules, style rolled inwards at the top with a lateral stigma, pod flattened 2-4 seeded, opening in two thickly coriaceous or woody valves, seeds shining scarlet or scarlet and black, rarely brown-red, the radicle very short ; trees, leaves pinnate, the leaflets usually opposite with a terminal odd one, flowers in terminal panicles, or rarely in simple racemes in the upper axils.

ORMOSIA TRAVANCORICA. (Bedd.) A tree, young parts fulvo-tomentose, leaves glabrous, 8-14 inches long by 4-7 broad, leaflets about 5-6 pairs with a terminal one oblong to elliptic with acute or obtuse point at the apex 2-6 inches long by ¾ to 2 inches broad, petioles ¼ to ½ an inch long, panicles in the upper axils shorter than the leaves, fulvo-tomentose as is the calyx and bracteoles, many flowered, flowers very shortly peduncled in pairs along their branches, legume very hard woody, 2-2½ inches long by 1½ broad, 1-2 seeded, seed bright scarlet.

A middling sized tree.—Travancore and South Tinnevelly Hills (up to 3,500 feet), S. Canara ghats, and probably elsewhere on the Western Ghats of our Presidency. The timber appears to be remarkably good, but at present is almost unknown.



Govindoo, del. Dumphy, lith.

Ormosia Travancorica (Bedd.)

ADENANTHERA PAVONINA. Linn. (Nat. ord. Leguminosæ ; Sub-ord. Mimosæ ; Tribe Adenantheræ.)

ADENANTHERA. (Linn.) *Gen. Pl.* 1, *p.* 589.—GEN. CHAR. Flowers pentamerous shortly pedicelled, calyx campanulate shortly toothed, petals cohering below the middle, or at length free, valvate, stamens 10 free scarcely exserted, anthers of the fertile flowers bearing a shortly stalked deciduous gland, ovary sessile many ovuled, style filiform, stigma small terminal legume linear often incurved or falcate compressed or swollen at the seeds 2 valved, valves entire, generally incurved at length contorted, seeds thick and hard, testa scarlet or two colored. Trees unarmed, leaves bipinnate, leaflets small in many pairs, racemes elongate slender axillary or panicled at the apex of the branches, flowers white or yellowish, hermathrodite or polygamous.

ADENANTHERA PAVONINA. (Linn.) A large tree, trunk erect, bark dark colored, scabrous when old, smooth when young, leaves alternate abruptly bipinnate 1-3 feet long, pinnæ opposite 4-6 pair, 4-12 inches long, leaflets alternate short petioled 4-12 pairs, oval with the margins waved smooth on both sides 1-2 inches long, petioles round smooth, colored, racemes terminal and from the upper axils solitary cylindrical about a span long, flowers numerous, small yellowish fragrant, bracts minute caducous.

This large timber tree is said to be wild in the forests of the Northern Circars and elsewhere, but I have myself never met with it wild It is very common in a cultivated state, particularly in gardens at Madras, and is abundant in Birmah. The timber, when fresh cut, much resembles the red sanders, and has a pleasant smell ; it is strong, but not stiff, hard, durable, tolerably close and even grained, and takes a good polish. When fresh it is of a beautiful red color with streaks of a darker shade, but afterwards turns purple and resembles rosewood. A cubic foot unseasoned weighs 62 lbs., and when seasoned 56 lbs ; its specific gravity is ·896, it is used for house building and cabinet making purposes ; it is known to Europeans as the red wood tree, and is called àni kundàmani in Tamil, Bandi gurinda in Telugoo ; Manjati in Malayalim, Thorla goonj in the Bombay Presidency, Madateya in Ceylon, and y-wai gyi in Burmah. The wood yields a red dye used by Brahmins in marking their foreheads. The seeds weigh 4 grains each, and are used as weights by jewellers. A cement is made by beating them up with borax and water, and the pulp is used medicinally. The tree is easily raised from seed, and is of rapid growth, and has been largely planted in some of our plantations.

BENGAL SECRETARIAT LIBRARY.

Govindoo del. Dumphy, Lith.

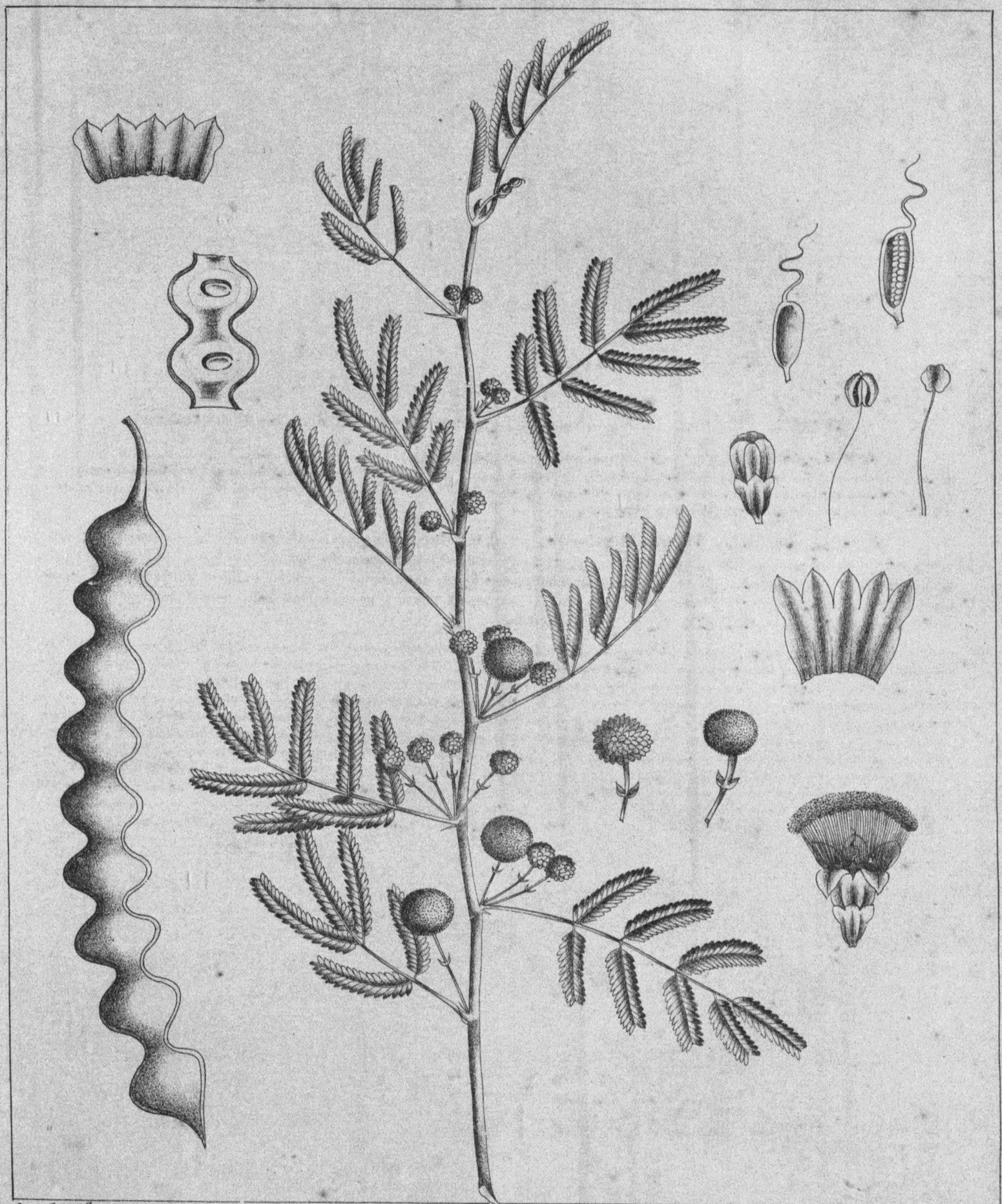
Adenanthera Pavonina (Linn.)

ACACIA ARABICA. Willd. (Nat. ord. Leguminosæ ; Sub-ord. Mimosæ ; Tribe Acacieæ.)

ACACIA. (Willd.) *Gen. Pl.* 1 *p.* 504.—Corol regular, sepals 5-4 or 3 free or united, petals as many, small valvate in the bud free or united, stamens indefinite usually very numerous, free or slightly connected at the very base, pod linear or oblong flat or nearly cylindrical, opening in 2 valves or indehiscent ; leaves twice pinnate or in some species (Australian) reduced to a simple dilated petiole, (phylloid) Flowers usually yellow or white in globular heads or cylindrical spikes often polygamous.

ACACIA ARABICA. (Willd.) Subarboreous, armed, branches terete glabrous, thorns stipulary sometimes long sometimes short or almost wanting, leaves bipinnate, pinnæ about 5 pairs with a gland between the first and last pairs, leaflets 15-20 pairs glabrous; peduncles aggregated axillary or forming a terminal raceme by the abortion of the leaves, heads of flowers globose yellow, corol 5 cleft, stamens numerous distinct ; legumes stalked compressed thickish contracted on both sutures between the seeds. *Willd. Sp.* 4, *p.* 1085 ;—*W. A. Prod. p.* 277 ;—Mimosa Arabica. *Lam.*

This is the well known Babul tree. It is common all over India, and also inhabits Ceylon ; but I have never seen it truly wild in the forests of the peninsula. Dr. Stewart however mentions that it is truly indigenous in Sind. The wood is close grained and tough, of a pale brownish red color. It is used for building purposes, axles and the naves, spokes and felloes of wheels, plough shares, sugar-cane rollers, kneed timbers for ship building, and many other purposes, but should be seasoned in water to exempt it from the attack of insects. It makes excellent charcoal, and is one of our best trees for locomotive fuel. When seasoned it weighs 54 lbs. the cubic foot, and its specific gravity is ·864 ; it is called Babul and Keekar in Hindustanee, Nallà toomà in Teligoo, and Kurroo vaylum in Tamil. The tree delights in black cotton soil, in which it grows very rapidly if irrigated, but it stands drought better than most trees, and will grow, though of course not so rapidly, without water, and in almost any soil. It is easily raised from seed, but rats often destroy the roots of the seedlings. The tree is sometimes raised from cuttings ; it will not answer well at any elevation over 3,000 or 3,500 feet. It is not often seen of any great size, but trees of 9 and 10 feet girth are sometimes met with. It is being extensively raised in all our fuel plantations in the plains. A transparent gum is procured from incisions in the bark, which is used as a substitute for the true Gum Arabic ; the bark is used medicinally, and also as a brown dye, and to a great extent for tanning purposes, and a decoction of it makes a good substitute for soap. The pod and leaves are good fodder for sheep, goats and cattle.



Govindoo, del.

Acacia Arabica (Willd.)

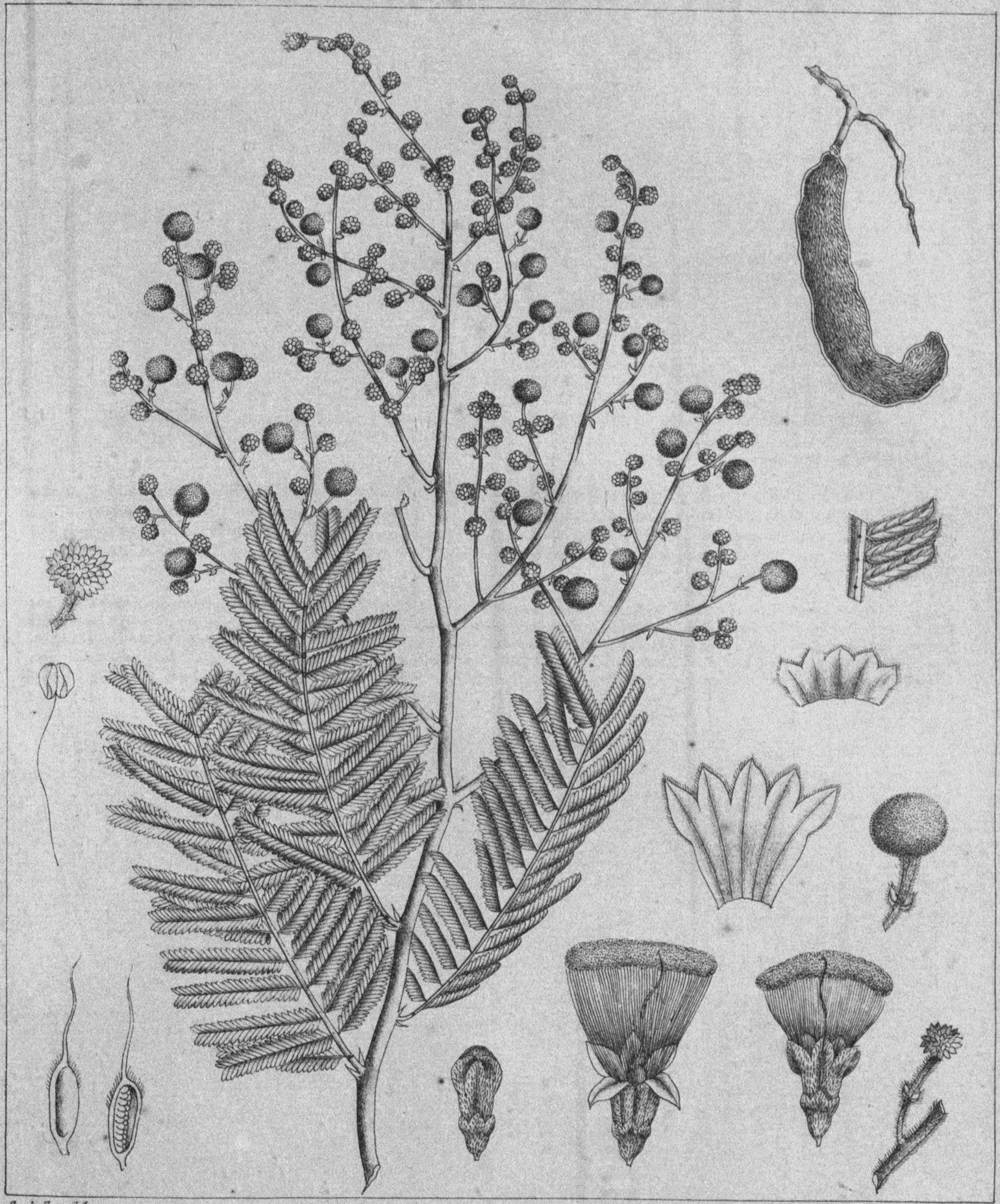
Dumphy, Lith.

ACACIA LEUCOPHLÆA. Willd. (Nat. ord. Leguminosæ ; Sub-ord. Mimosæ ; Tribe Acacieæ.)

For Gen. Char. see under Acacia Arabica.

ACACIA LEUCOPHLÆA. (Willd.) A good sized tree, armed with stipulary thorns, leaves bipinnate, pinnæ 7-12 pairs with a gland below the first and between some of the last pairs, leaflets 16-30 pairs oblong linear pubescent or nearly glabrous, panicles large terminal, or from the upper axils, branches and peduncles shortly tomentose, heads of flowers globose shortly peduncled, corol 5 cleft, stamens numerous distinct, legume narrow linear long curved shortly tomentose. *Willd. Sp.* 4, *p.* 1083 ;—*W. A. Prod.* 277 ;—Mimosa leucophlæa. *Roxb. Fl. Ind.* ii. *p.* 558.

This white barked Acacia is readily distinguished by its panicled globular inflorescense, and stipulary thorns; it is a common tree throughout the three Presidencies and in Ceylon. The timber is hard and strong, much like Babul, but closer grained and of a deeper color ; it is used for the same purposes. A cubic foot unseasoned weighs 62 lbs., and 55 lbs. when seasoned ; its specific gravity is ·880. *It makes excellent fuel for locomotive purposes. It is called Sufaed Keekar in Hindustanee, Velvaylum in Tamil, Tellà tumà in Teligoo, Hewar in Bombay, and Katu andara in Ceylon. The bark is largely used in the distillation of arrack from Jagiri ; it also yields a fibre which is tough and strong, and used for fishing nets and cordage.*



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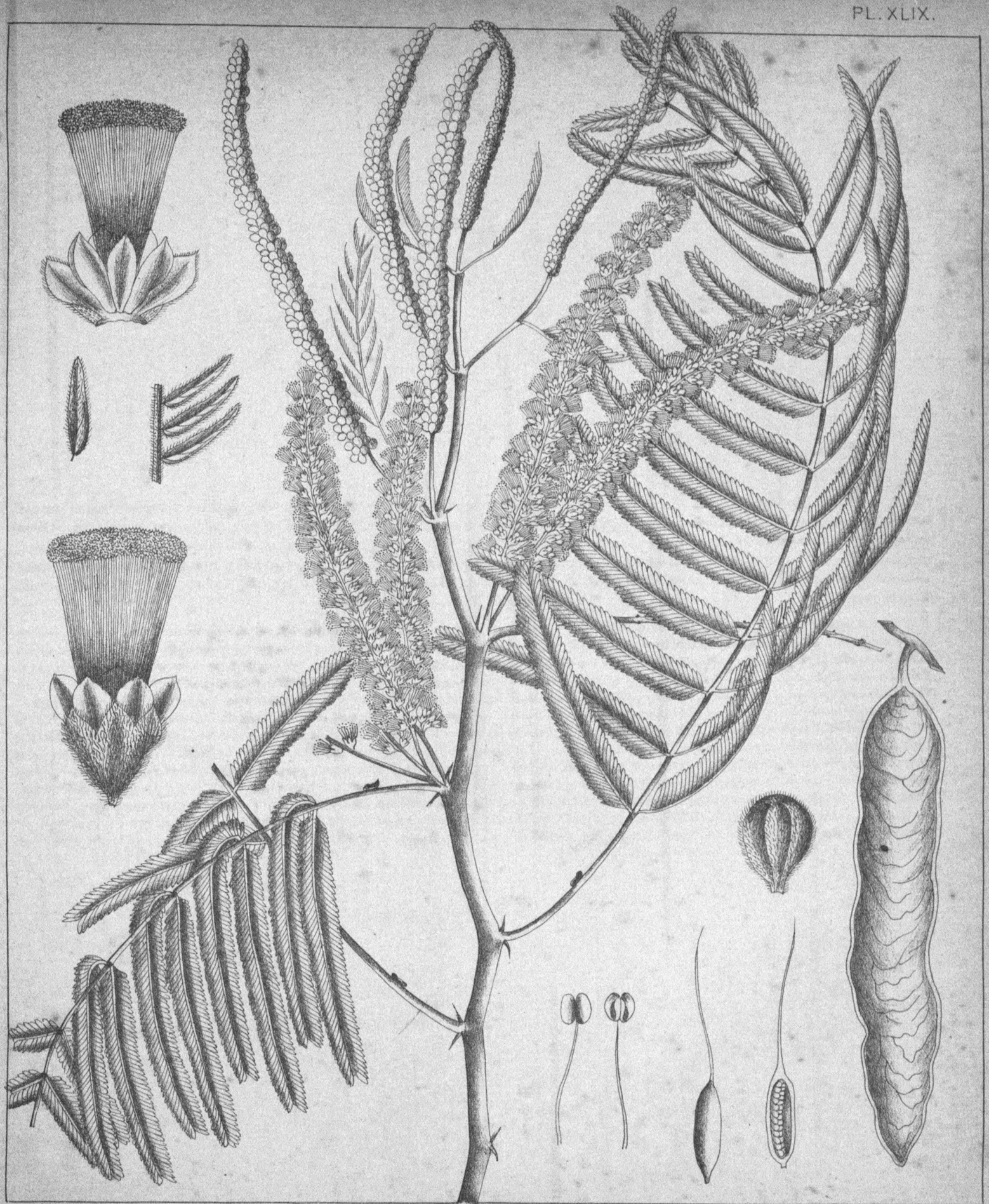
Acacia leucophlæa (Willd.)

ACACIA CATECHU. (Nat. ord. Leguminosæ, Sub-ord. Mimoseæ.)

For Gen. Char. see under "Acacia Arabica."

ACACIA CATECHU. (Willd.) Arboreous, branches armed with stipulary thorns or sometimes unarmed, young shoots petioles and peduncles more or less pubescent, leaves bipinnated, pinnæ 10-30 pair, leaflets 30-50 pair puberulous, petiole sometimes armed on the under side with a row of prickles, with one large gland below the lowest pair of pinnæ and between the 1-7 extreme pairs, spikes axillary 1-4 shorter than the leaves; flowers numerous, petals united, stamens distinct, numerous, legume flat thin straight linear glabrous 4-8 seeded. *Willd. Sp.* iv. *p.* 1079;—*W. A. Prod. p.* 272. A, polyacantha, *Willd. l. c.* A. Wallichiana, *D. C. Prod.* ii. 458. Mimosa catechuoides. *Roxb. Fl. Ind.* ii. p. 562. Mimosa Catechu, *Roxb. Fl. Ind.* ii. *p.* 563.

A middling sized tree, with a dark brown bark, common all over India, Birmah and Ceylon, ascending to an elevation of 3,000 *or rarely* 4,000 *feet, it is very closely allied to A. Sandra, but differs in being softly puberulous and in its more numerous pinnæ, and leaflets, and it generally has a gland between the* 6-7 *extreme pair of pinnæ, whereas in Sandra only the* 1-3 *upper pair have a gland between them. Acacia Suma of Roxburgh is also closely allied, if not identical with this species. It is called in Hindoostanee Khaira; and Wothalay in Tamil. The substance of Catechu (formerly called terra japonica) is obtained from the wood of this tree and of the Acacia Sandra, chips of the heartwood are boiled in earthen pots, the clear liquor is strained off; and when of sufficient consistence, it is poured into clay moulds; the extract is used in dyeing and also medicinally as an astringent, and externally as an ointment for itch, syphilis and burns. Very good catechu is obtained from Birmah, and a considerable quantity is made in South Canara, chiefly from A. Sandra, and large quantities are exported from Bengal. One pound of Catechu has been found to be equal to* 7 *or* 8 *lbs. of Oak bark for tanning purposes. The timber is dark colored; hard and heavy; unseasoned it weighs* 85 *to* 90 *lbs. the cubic foot, and nearly* 80 *lbs. when seasoned, and has a specific gravity of* 1·232*; it is close grained and durable, works smoothly and stands a good polish, and though somewhat brittle is much valued where strength is required, it is used for ploughs, pestles, &c., and in house building and the construction of carts; it is not attacked by white ants. The tree flowers in July, and the seeds ripen in the cold weather. In Ceylon it is called Rat-kihiri, and an infusion of the wood is much esteemed by the natives as a purifier of the blood, and drinking cups are made of it.*



Govindoo, del. Dumphy, Lith.

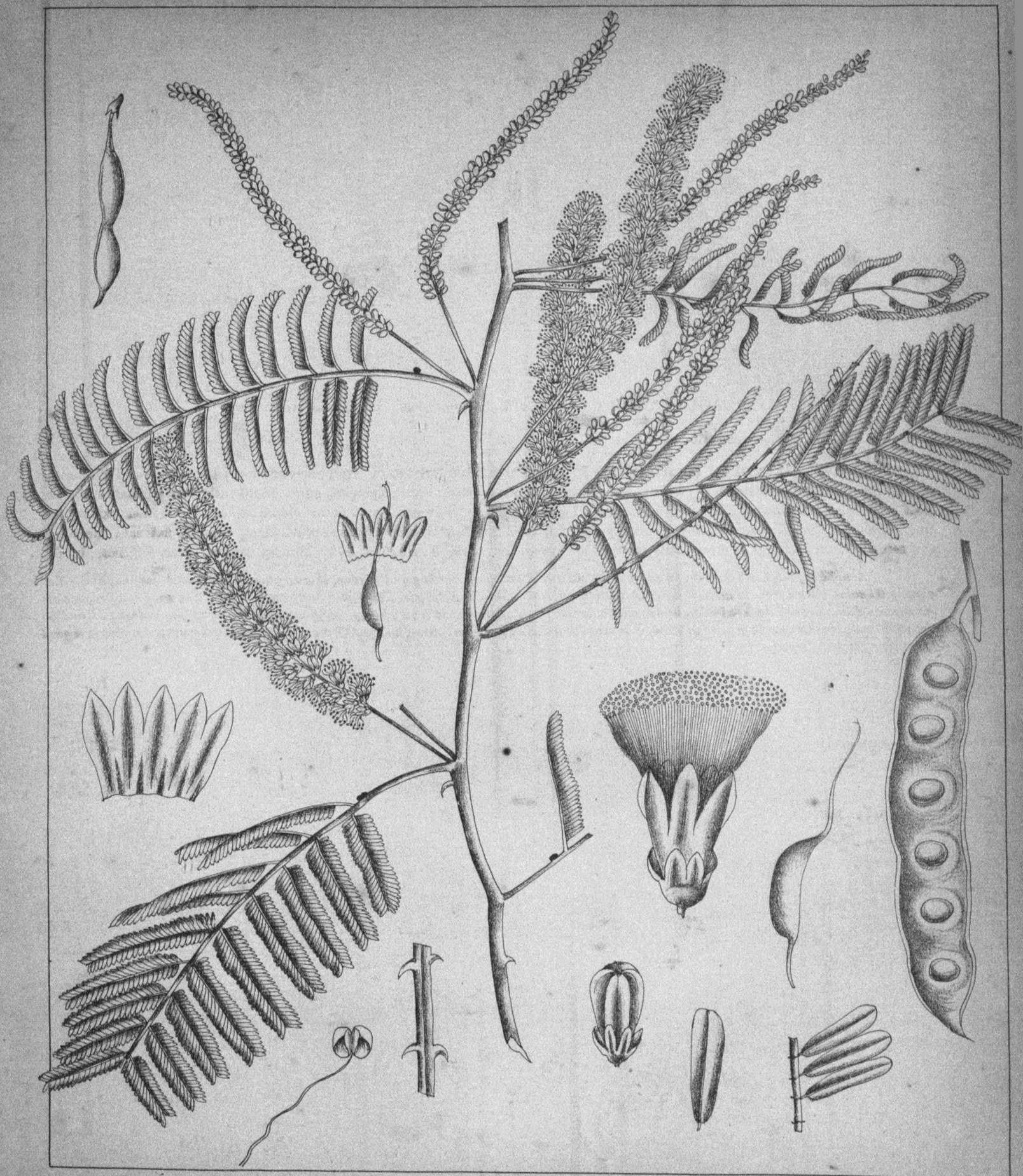
Acacia Catechu (Willd.)

ACACIA SANDRA. (Nat. ord. Leguminosæ, Sub-order Mimoseæ)

For Gen. Char. see under "Acacia Arabica."

ACACIA SANDRA. (Roxb.) A tree 20-30 feet high, bark dark brown, everywhere glabrous, branches armed with compressed decurrent recurved stipulary prickles, sometimes entirely unarmed, leaves bipinnate, pinnæ 15-20 pairs with a gland on the petiole below the lowest pair and between the extreme 1-3 pairs, leaflets 20-40 pair small linear obtuse spikes 1-3 together axillary peduncled shorter than the leaves, cylindrical, many flowered, corol 5 cleft, stamens very numerous distinct, legumes flat thin lanceolate few seeded; suture straight or occasionally emarginate between the seeds. *W. A. Prod.* 273. Mimosa sandra. *Roxb. Fl. Ind.* ii. 562.

A middling sized tree common throughout the Madras Presidency, Bombay and Mysore, it is very nearly allied to A. catechu, and yields exactly the same extract from its wood, it is called Sandra and Nalla Sandra in Teligoo, Karangalli and bàgà in Tamil. The wood is tolerably close grained and durable; of a dark red color, veined with a darker shade of streaks, it is very heavy, weighing about 96 *or* 98 *lbs. unseasoned, and* 80 *lbs. when seasoned; its specific gravity is* 1 296, *it is used for building purposes (beams and posts), ploughs, mortars and pestles, &c., and is a good wood for piles and sleepers.*



Govindoo del.

Acacia Sandra (Roxb.)

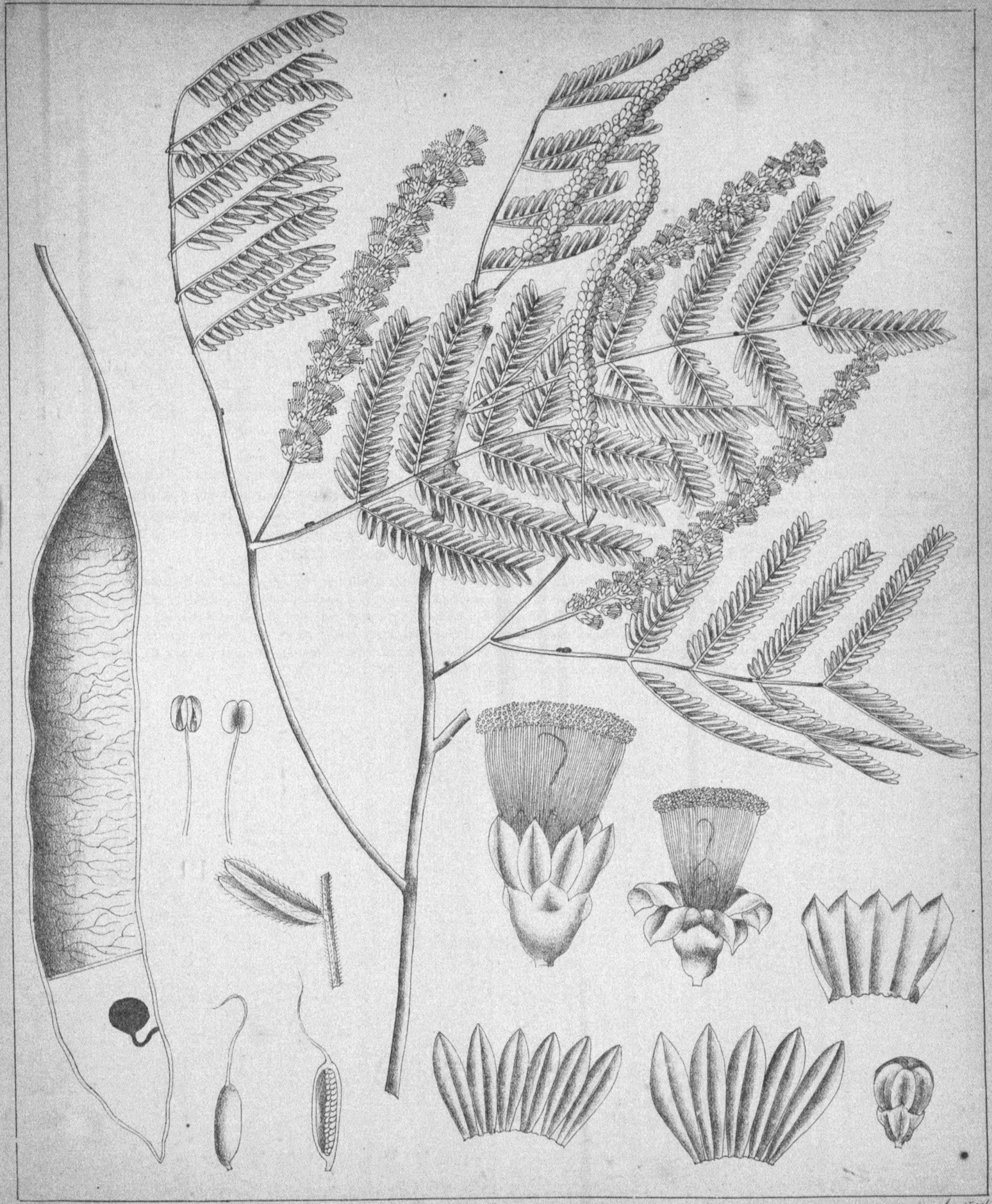
Dumphy, Lith.

ACACIA FERRUGINEA (Nat. ord. Leguminosæ, Sub-order Mimoseæ.)

For Gen. Char. see under "A. Arabica."

ACACIA FERRUGINEA. (Roxb.) A middling sized tree, 20-30 feet high, bark deeply cracked, dark rusty colored; armed with stipulary conical thorns, occasionally unarmed, branches diffuse, leaves glabrous bipinnate, pinnæ 3-6 pair with one gland on the petiole and one between each of the 1-2 extreme pairs, leaflets 10-20 pair oblong linear obtuse, spikes axillary, usually in pairs cylindrical many flowered, corol 5 cleft, stamens numerous free or slightly united at the very base, legumes flat lanceolate obtuse hard 2-6 seeded. *D. C. prod.* ii. *p.* 468. *W. A. Prod. p.* 273. Mimosa ferruginea. *Roxb. Fl. Ind.* ii. 561.

This tree much resembles Acacia Catechu and Sandra and differs chiefly in the smaller number of pinnæ; it is common in the jungles hroughout the Madras Presidency, in Mysore and Birmah, it is called Ansandra and Woonee in Teligoo, Vel Veylum in Tamil, and Sitnet in Birmah; it flowers in April and May, the bark is very astringent, and is used by the natives in the distillation of arrack from jaggery in the same way as the bark of A. leucophlæa. The wood is of a reddish brown, streaked with a darker hue, heavy and durable, and does not warp or crack, the grain rather coarse and even, works well and gives a smooth surface; it is used in building and in the construction of carts, ploughs, &c.; it weighs 60 lbs. per cubic foot when seasoned and 65-70 lbs. unseasoned, and has a specific gravity of ·960.



Govindoo, del. Dumphy, lith.

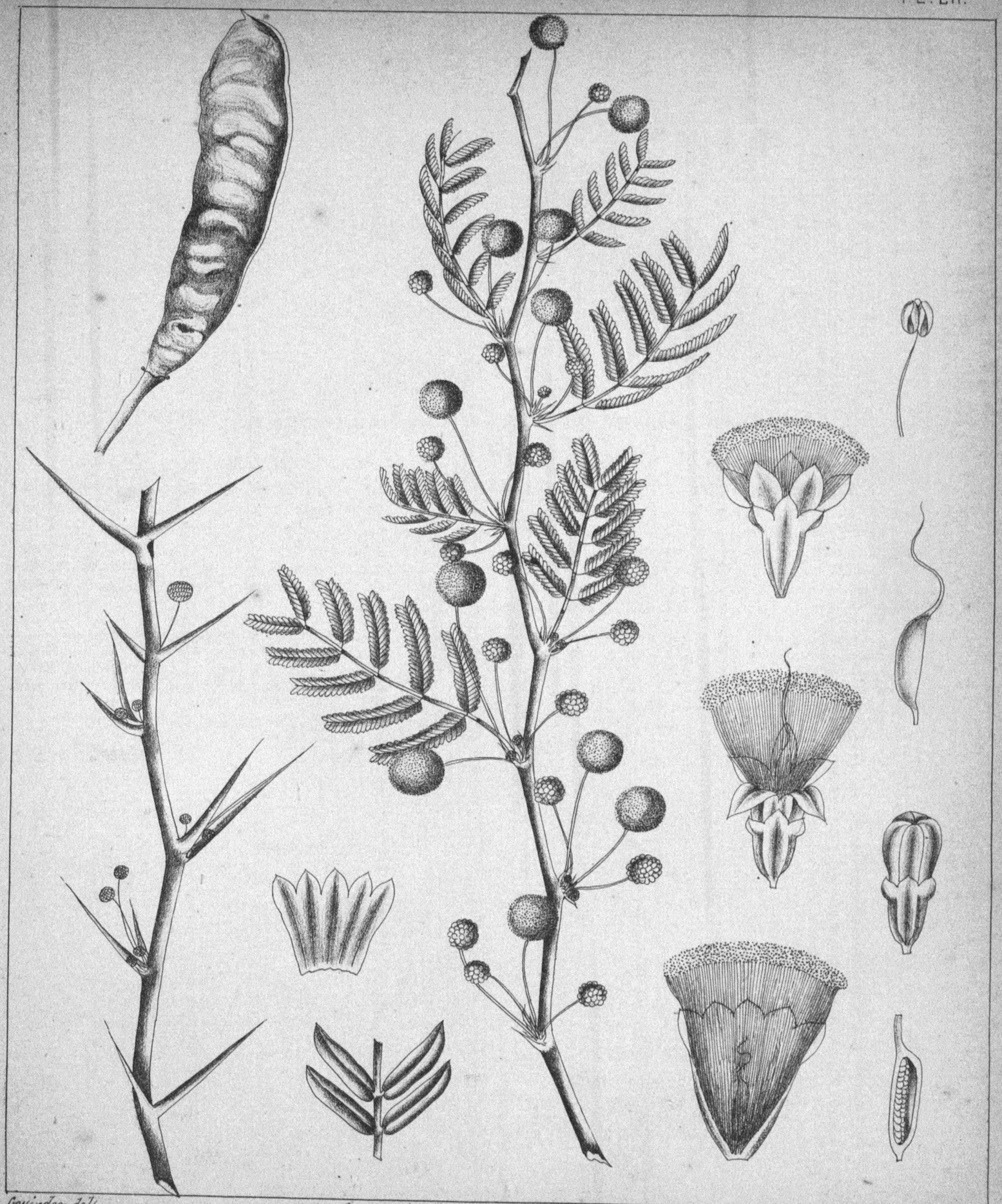
Acacia ferruginea (Roxb.)

ACACIA FARNESIANA. (Nat. ord. Leguminosæ, Sub-order Mimoseæ.)

For Gen. Char. see under "Acacia Arabica."

ACACIA FARNESIANA. (Willd.) A small tree much branched glabrous or slightly pubescent on the petioles and peduncles; leaves bipinnate, pinnæ 4-8 pair with a gland between the lower and often between the uppermost pair, leaflets 10-20 pair linear about 2 lines long, stipules converted into slender straight thorns very variable in length, the tree otherwise unarmed, peduncles usually 2 or 3 together in the older axils, each bearing a single globular head of yellow sweet scented flowers, polygamous bisexual and male, calyx 5-toothed, corol tubular gamosepalous 5 (rarely 6) toothed, stamens very numerous distinct, legume thick, irregularly cylindrical or fusiform turgid, indehiscent filled with a pithy substance in the midst of which lie a double row of seed.—*Willd. Sp.* iv. *p.* 1083, Mimosa Farnesiana, *Roxb. Fl. Ind.* ii. *p.* 557. Vachellia Farnesiana, *W. A. Prod. p.* 272.

Apparently indigenous all over the Madras Presidency, Mysore, Bombay, Bengal, but supposed to be of American origin, and to have been naturalized and run wild, it is also found in Africa and N. Australia, it is called Kusturi and Odù sàle in Teligoo, Vedda va'la in Tamil, Julli in Canarese and Iri babul in Bombay. The wood is very hard and tough, and is used for ship knees, tent pegs, ploughs, &c. &c. A considerable quantity of gum exudes from the trunk, and a delicious perfume is made from the sweet scented yellow flowers; it makes a good fence if properly pruned, and the tree will grow up to an elevation of 5000 *feet.*



Govindoo, del.

Acacia Farnesiana (Willd.)

Dumphy, lith.

ALBIZZIA LEBBEK. (Nat. ord. Leguminosæ, Sub-order Mimoseæ, Tribe Ingeæ.)

ALBIZZIA. (Durazzini.) *Gen. Pl.* 1. *p.* 596.—GEN. CHAR. Flowers pentamerous hermathrodite or rarely polgamous, calyx campanulate or tubular toothed or shortly lobate, corol infundibuliform, petals connate to beyond the middle, valvate stamens indefinite, usually numerous and long, united in a tube at the base, anthers small, legume broadly linear or oblong flat, thin indehiscent or opening in 2 valves, continuous within, valves not elastic or contorted, seed ovate or orbicular compressed, funicle filiform. Unarmed trees or shrubs, leaves bipinnate with a gland on the petiole below the pinnæ and others between some or all the pinnæ and leaflets, flowers in globular heads or rarely cylindrical spikes usually hermathrodite, the stamens usually white or pink, rarely yellow, much longer than in Acacia. This genus differs from Acacia chiefly in the stamens being united into a tube instead of being free or nearly free at the base, and also in its much longer stamens.

ALBIZZIA LEBBEK. (Benth.) A large tree, trunk generally short, bark ash-colored, young branches flexuose glabrous, leaves about the ends of the branchlets, bipinnate, about a span long, pinnæ 1-4 pair (sometimes the lower pairs are somewhat alternate) with a large gland a little below the base of the petiole, leaflets opposite, 4-9 pair oval obtuse or retuse unequal glabrous, about an inch and a half long and three-fourths broad, with often 1-2 small glands near the base of the partial petioles, and small ones between the leaflets, but their presence and number is always uncertain, except those near the base; peduncles axillary 1-4 together, each bearing a globular head of shortly pedicelled, white fragrant flowers, calyx long tubular, petals 5 united to beyond the calyx, stamens very long numerous monadelphous, legume leafy, thin flat broadly linear from 6 to 12 inches long by 1 to 2 broad, remotely 8-10 seeded indehiscent. *Benth. in Hook. Journ. Bot.* iii. 87. Acacia Lebbek, *Willd, D. C. Prod.* ii. 466. Acacia speciosa, *Willd, D. C. Prod.* ii. 467. Mimosa serissa, *Roxb. Fl. Ind.* ii. 544. Albizzia latifolia, *Boivin. Encyc.*

This tree is common in every part of India, and in Birmah and Ceylon; it is better known under the name of Acacia or Albizzia speciosa, and was long supposed to be distinct as a species from Lebbek, it grows to about 50 *feet high, with a trunk up to* 8 *and rarely* 12 *feet in girth; it flowers in the hot weather, and the seeds ripen in the rains. It is generally nearly destitute of leaves in the cold season, and it has an extensive but thin head, it grows in almost all soils and situations. It is called Siris in Hindustanee (and is generally known by this name to Europeans), Dirasan and Pedda duchirram in Teligoo, Vàghe and Kàt Vàghe in Tamil, and Sit in Birmah. When seasoned the timber weighs* 50 *lbs. the cubic foot and has a specific gravity of* ·800, *it is hard and durable, of a light reddish brown color, with darker veins, and it is not liable to warp or crack. It is used for a great variety of purposes, naves of wheels, pestles and mortars, picture frames, furniture, parts of boats, &c., and the heartwood makes good charcoal. A gum very similar to Gum Arabic exudes from the trunk, and the leaves and twigs are good fodder, the seed is officinal, it is easily raised from seed, and is of very rapid growth, and grows well from cuttings, poles stuck in the ground rooting readily, its branches are brittle and suffer in localities exposed to the wind.*

Gowindoo, del.

Dumphy, Lith.

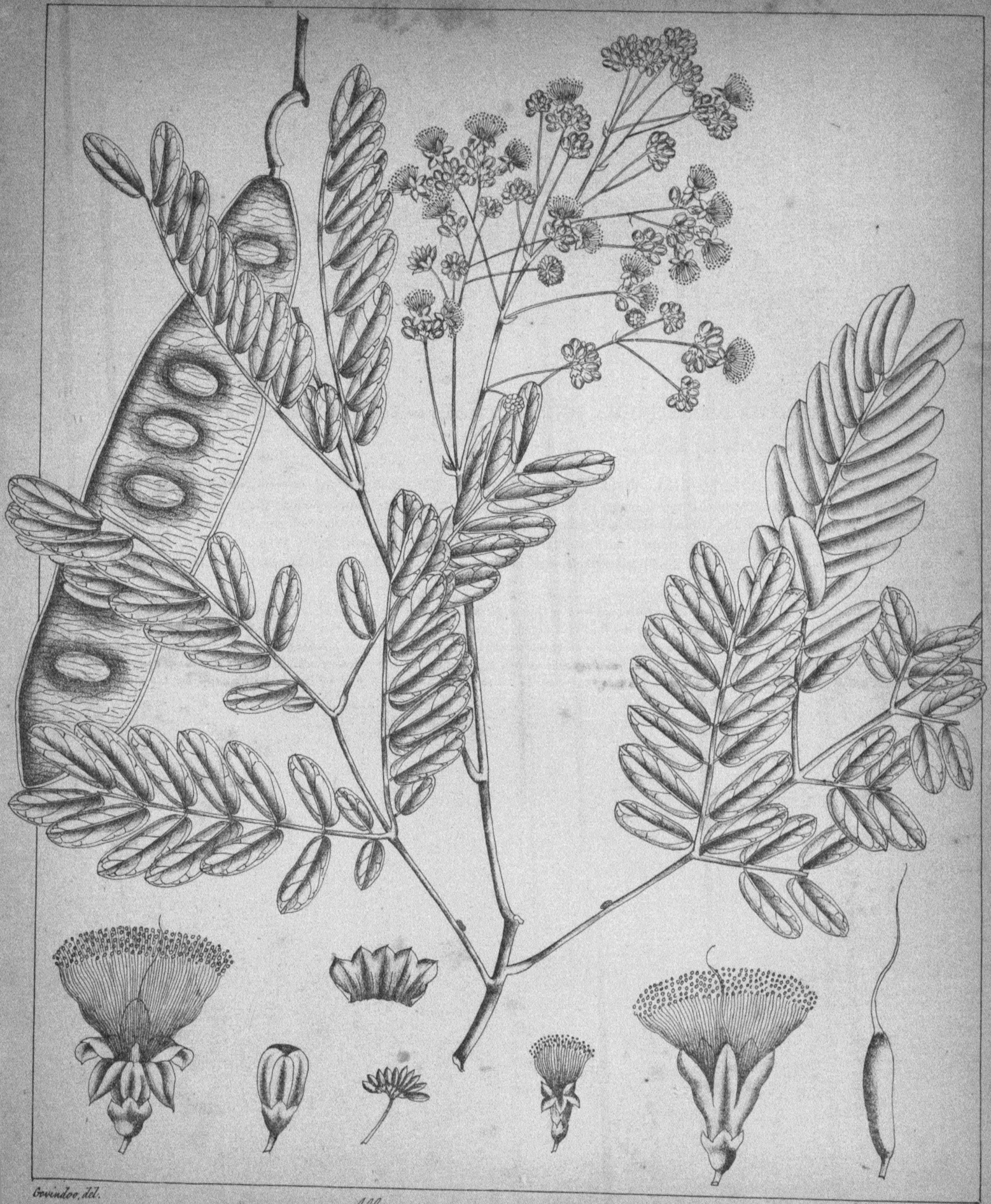
Albizzia Lebbek (Benth.)

ALBIZZIA ODORATISSIMA. (Nat. ord. Leguminosæ, Sub-order Mimoseæ, Tribe Ingeæ.)

For Gen Char. see under "Albizzia Lebbek."

ALBIZZIA ODORATISSIMA. (Willd.) A large tree, unarmed, branches glabrous, leaves bipinnate, pinnæ 3-4 pair with a gland on the petiole and between the uppermost pair: leaflets 10-14 pair, narrow oval obtuse oblique glabrous pale on the under side: panicle terminal and axillary, the ultimate divisions cymose or somewhat umbellate, flowers in small globose heads, corol tubular 4 cleft to the middle, stamens monadelphous, legume flat broadly linear, thin, thick margined, about 10 seeded. *Willd, Sp.* iv. *p.* 1063. Mimosa odoratissima, *Roxb. Fl. Ind.* ii. 546. Acacia odoratissima, *W. A. Prod. p.* 275. A. lomatocarpa, *D. C. Prod.* ii. 467. Mimosa marginata, *Lam.*

This is one of our most valuable jungle timbers; it is abundant throughout the Madras Presidency, in Mysore, Bombay, Bengal, Birmah, and Ceylon, its Tamil name is Kar Vàghe; and in Teligoo it is called Shindugu and Telsu, and in Ceylon Hoore mara; it does not ascend the mountains much above 3000 *feet. The wood is hard, coarse grained, equal to Teak in strength, of a dark reddish brown or brown color, and takes a good polish; it is much used for building and cabinet purposes, naves and felloes of wheels, &c., its specific gravity is* ·736 *and when seasoned it weighs* 46 *lb. the cubic foot. The tree flowers in the hot season; the juice of the bark is used medicinally by the natives.*



Govindoo, del.

Albizzia odoratissima (Willd.)

Dumphy, lith.

ALBIZZIA STIPULATA, (Nat. ord. Leguminosæ, Sub-ord. Mimoseæ, Tribe Ingeæ.)

For Gen. Char. see under "Albizzia Lebbek."

ALBIZZIA STIPULATA. (D. C.) A very large tree, unarmed, young shoots irregularly angled, and the petioles tomentose, leaves bipinnate, pinnæ 6-20 pair with a gland on the petiole and between each of most of the upper pairs; leaflets 20-30 pair on each, pinna, oblongo-linear falcate acute 3-5 lines long, the midrib close to the inner edge, stipules membranous semicordate acuminate, sometimes nearly an inch long, very conspicuous on the young branches, but soon deciduous, peduncles usually about ½ inch long, clustered along the branches of a terminal panicle, bracteas large, heads consisting of 10 to 20 flowers about 3 lines long, corol tubular pubescent 5 cleft, stamens about 20, above 1 inch long monadelphous at the base, calyx much shorter than the corol pubescent, legume 3-5 inches long, 9-10 lines broad, flat thin linear lanceolate glabrous 6-12 seeded. *D. C. Prod.* ii 469. Acacia stipulata. *W. A. Prod.* 274. Mimosa stipulata. *Roxb. Hort. Bengh.* Mimosa stipulacea. *Roxb. Fl. Ind.* ii. *page.* 549.

This very handsome tree is not uncommon throughout the Madras Presidency, Mysore, Bombay, Bengal, Birmah and Ceylon; it ascends the mountains to nearly 6,000 feet, but is also common in the plains, particularly in S. Canara, where its timber is much in use. It is called Konda chiragu in Teligoo, and sometimes Chindagu; Kal bage in S. Canara, Seet and Boomayza in Birmah, and Cubal mara in Ceylon. The timber is strong, compact, stiff, coarse grained and fibrous, of a light reddish brown color, and is used for building purposes, naves of wheels, &c., its specific gravity is ·880, and it weighs 55 lbs. the cubic foot when seasoned, and 63 to 65 unseasoned; it attains a very large size, and must be a very rapid grower, as Dr. Roxburgh mentions one that he planted which measured 48½ inches in circumference at 4 feet from the ground, when 7 years old, and Dr. Stewart mentions one that measured 7 feet in girth when 17 years of age in the Saharunpore garden.

Govindoo, del.

Albizzia stipulata (D. C.)

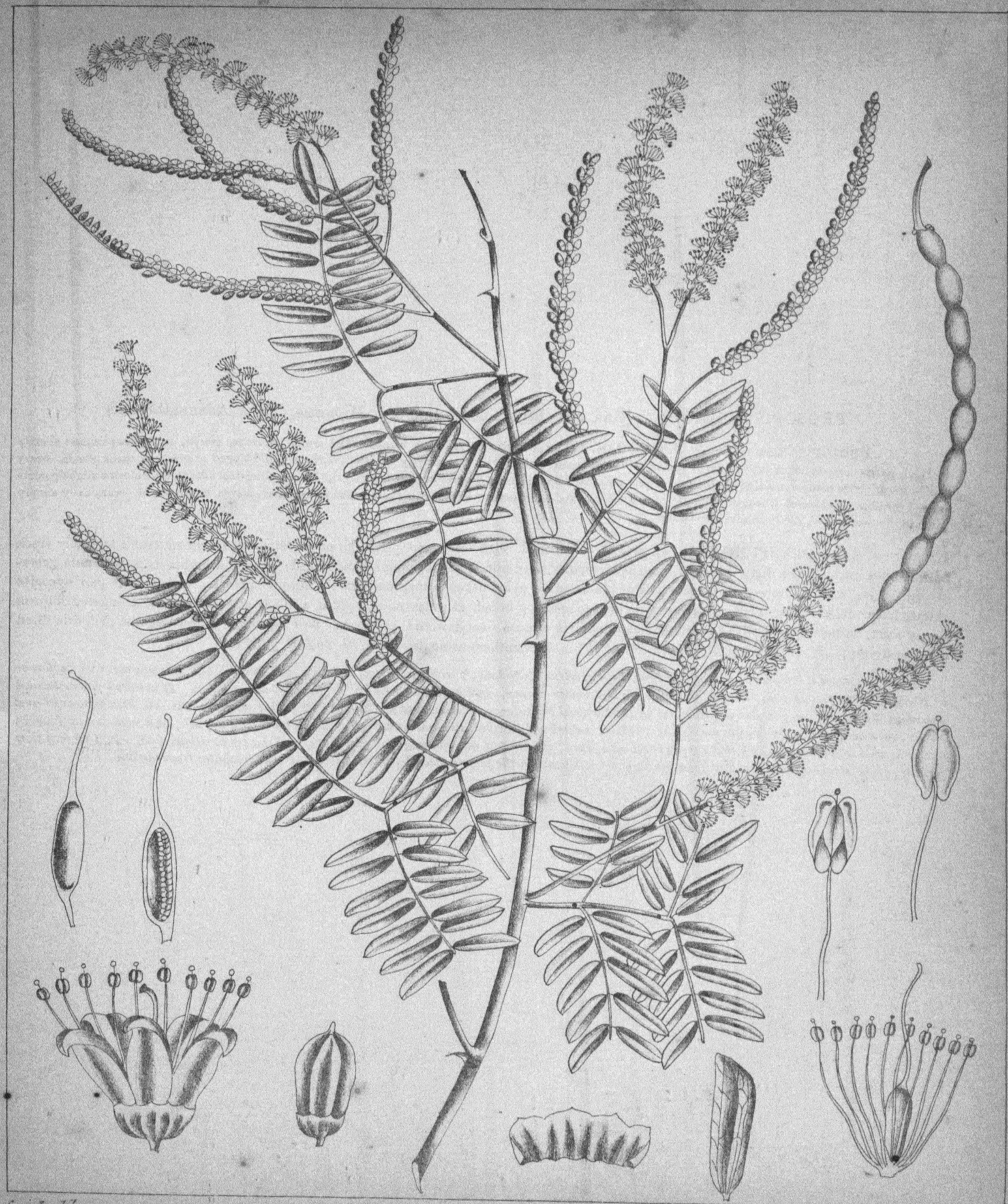
Dumphy, lith.

PROSOPIS SPICIGERA (Nat. ord. Leguminosæ, Sub-ord. Mimoseæ, Tribe Adananthereæ.)

PROSOPIS. (Linn.) *Gen. Pl.* 1, 591.—GEN. CHAR. Flowers polygamous bisexual and male, 5-merous, sessile, calyx campanulate shortly toothed, petals connate below the middle or at length free valvate, stamens 10, free shortly exserted, anthers gland-tipped or rarely without glands, ovary sessile or stipitate many ovuled, style filiform, stigma terminal small, legume continuous filled with pulp linear cylindrical falcate or contorted slightly compressed torulose indehiscent at length falling to pieces ; seed ovate compressed. Trees or shrubs armed or unarmed, leaves bipinnate or occasionally simply pinnate, flowers spiked, rarely in globular heads.

PROSOPIS SPICIGERA. (Linn.) A tree armed with scattered prickles, or occasionally unarmed, trunk tolerably erect, bark deeply cracked, of a dirty ash color, branches irregular, very numerous, forming a shady head; leaves 2-4 inches long, alternate generally bipinnate, with 1-2 rarely 4 opposite pair of pinnæ and a gland between each pair, rarely simply pinnate, leaflets 7-10 pair opposite oblong linear obtuse entire glabrous, about ½ an inch long and ⅛ broad, stipules none, spikes axillary several together elongated filiform nearly erect, anthers tipped with a deciduous gland, bracts minute one flowered caducous, flowers small yellow, legume cylindric filled with mealy pulp. *W. A. Prod. p.* 271. *Linn. Mant. p.* 68. Adenanthera aculeata, *Roxb. Fl. Ind.* ii. p. 371.

This tree is tolerably common throughout the Madras Presidency; and in Mysore, Bombay, and Bengal, but does not occur in Ceylon or in Birmah; it is frequently found of large size in the denser forests, and rarely attains to a girth of about 9 feet. It is called Perumbe and Vunne in Tamil, Shumee in Bengal, Sounder in the Bombay Presidency, and Sumree in Guzerat; its timber weighs about 100 *lbs. unseasoned and* 72 *lbs., seasoned, and has a specific gravity of* 1·152. *It is dark red in color, straight and close grained, hard and durable, and superior to Teak in strength, and is much used for building purposes and cart wheels, and occasionally for furniture, and makes excellent fuel. It is of very slow growth; it flowers in the hot weather; the mealy sweet substance in the pod is eaten by the natives, and a gum exudes from the tree.*



Gouindoo, del.

Prosopis spicigera (Linn.)

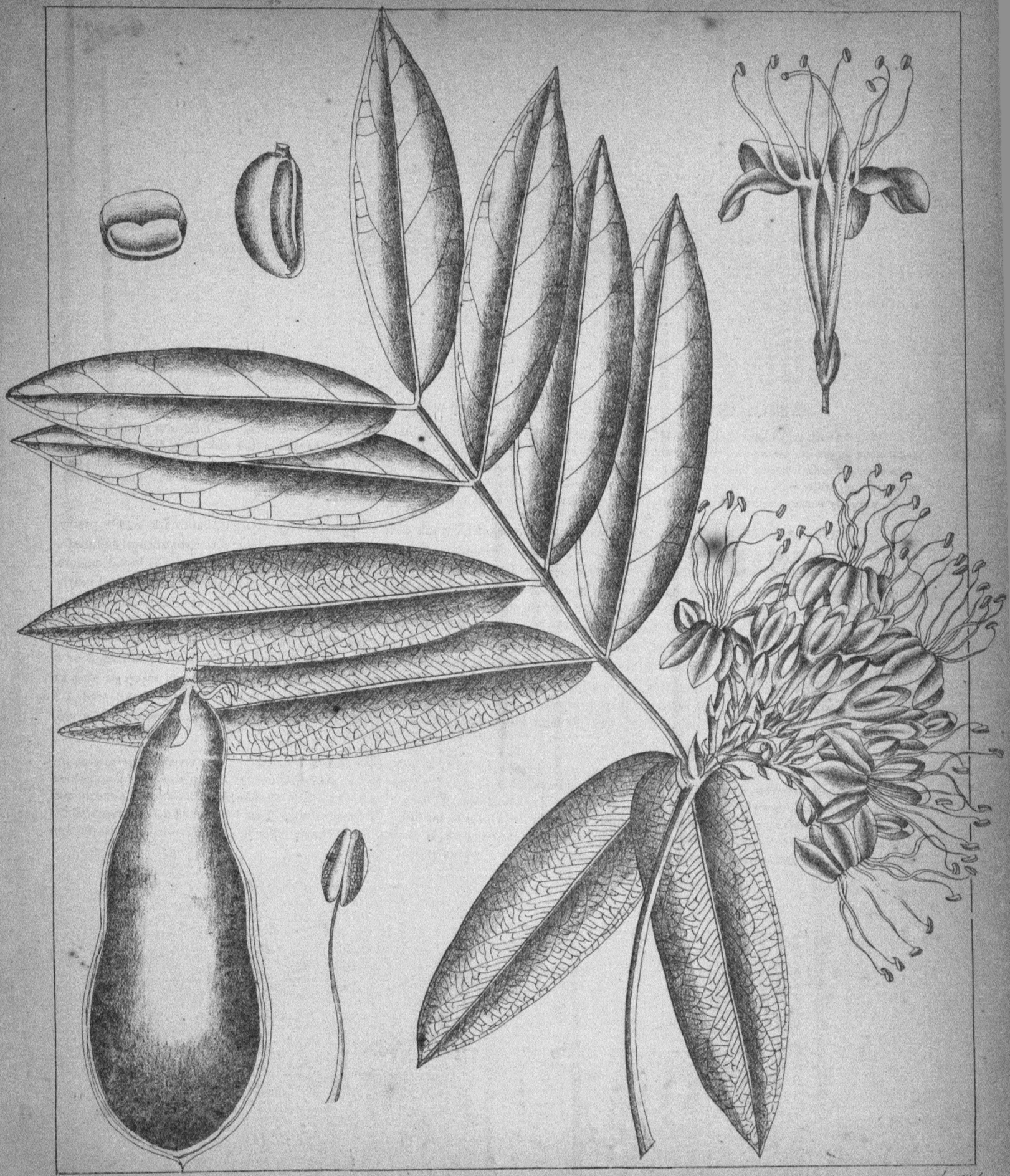
Dumphy, lith.

SARACA INDICA. (Nat. ord. Leguminosæ, Sub-ord Cæsalpinieæ, Tribe Amhersteæ.)

SARACA (Linn) *Gen Pl* 1. 583 —GEN. CHAR Calyx furnished at the base with 2 opposite bracteoles, tube lined with a disk elongate, segments 4-5 petaloid, ovate subequal imbricate, petals none, stamens 3-9 rising from the crenulated ring-like apex of the disk, free, filaments elongate, anthers oblong, cells dehiscing longitudinally ovary stipitate, the stalk below cohering to one side of the calyx tube free above, style filiform, stigma terminal obtuse, ovules 8-12, legume oblong or elongate compressed or a little turgid 2 valved 4-8 seeded, seed exarillate, albumen none Trees unarmed leaves abruptly pinnate, leaflets few paired, stipules intra foliaceous caducous, racemes panicled (Jonesia *Roxb*)

SARACA INDICA. (Linn) A middling sized ramous tree, trunk erect though not very straight, bark dark brown, pretty smooth, branches numerous, spreading in every direction and forming an elegant and shady head, leaves alternate abruptly pinnate, sessile 10 15 inches long, when young pendulous and colored, leaflets opposite 4 6 pair, lanceolate 4-6 inches long by 1-1½ broad, smooth shining and firm in texture with the margins often a little waved, stipules intra-foliaceous, caducous, panicles short axillary and terminal nearly globular, large and crowded with flowers, bracts small cordate, flowers pretty large, when first expanding of a bright orange color, changing to red, fragrant at night, calyx funnel shaped, furnished at the base with 2 nearly opposite colored cordate bracts, tube of the calyx slightly incurved firm and fleshy, lined with a disk, divisions of the calyx 4 rarely 5, spreading petaloid ovate subequal, imbricate, one third the length of the tube, corol none, stamens 7, rarely 8-9 rising from the crenulated ring-like apex of the disk, filaments equal free, 3 or 4 times longer than the divisions of the calyx, ovary stipitate, the stalk below cohering to one side of the calyx tube, style nearly as long as the stamens, stigma single, legume scimitar shaped turgid on the outside, reticulated 6 to 10 inches long and about 2 broad, seed 4 8 smooth *Linn. Mant. p.* 98. *Rheed. Mal* v *p* 59. Jonesia Asoca, *Roxb. Fl. Ind* ii. p. 218. Saraca arborescens, *Burm. Ind. p.* 85. *t* 25 *f.* 2 Saraca pinnata, *Willd. Sp.* ii. *p.* 287.

This exceedingly handsome tree is indigenous up to an elevation of 3,000 *feet in the forests of S. Canara, the Concan, Mysore, Gumsur, Cuttack, Eastern Bengal and Ceylon, and is cultivated in gardens at Madras and all over India ; its bright orange flowers and pendulous colored young leaves make it very showy when in flower. It is called Asok or Asoka in Bengal, Ashunkar in S. Canara, Jassoondie in the Concan, and Deya-ratmal in Ceylon , it flowers during the hot season, and its seed ripens in the rains. I know nothing of its timber, and am not aware that it has ever been tried ; as a shade yielding ornamental tree it scarcely has an equal ; it is much better known under Roxburgh's name of Jonesia than under the old Linnean name of Saraca, but the latter has priority and is now adopted.*



Govindoo, del. Dunphy, Lith.

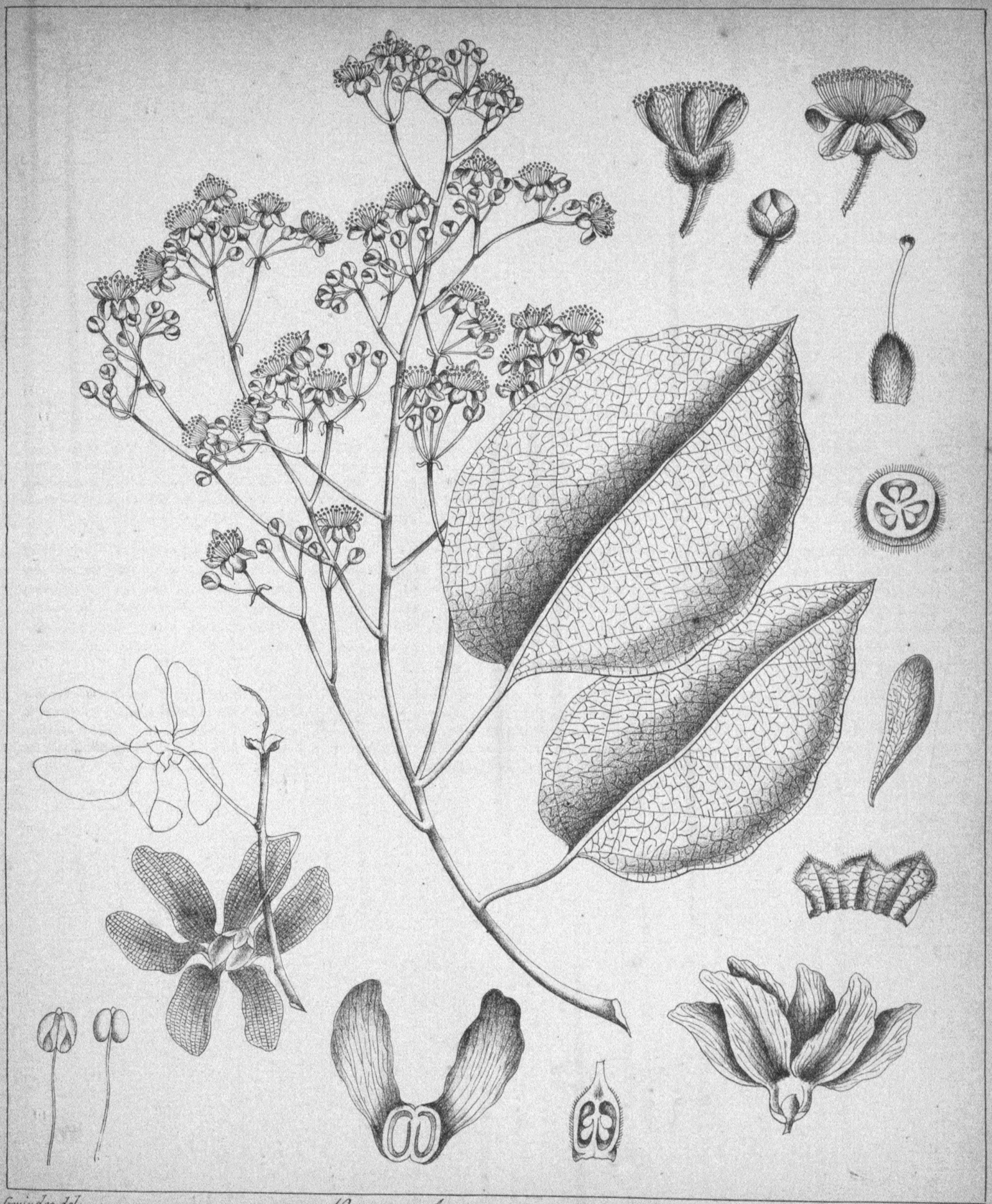
Saraca Indica (Linn.)

BERRYA AMMONILLA. (Nat. ord. Tiliaceæ.)

BERRYA. (Roxb.) *Gen. Pl.* 1. *p.* 232.—GEN. CHAR. Calyx campanulate irregularly 3-5 cleft, petals 5, naked at the base, stamens numerous free inserted on to the torus, which is not elevated, staminodia none, anthers subglobose, cells at length confluent, ovary 3 lobed, 3 celled cells 4 ovuled, style subulate, stigma 3 lobed, capsule subglobose 6 winged, 3 celled 3 valved loculicidal, each valve furnished with 2 large oblong membranaceous reticulated horizontal villous wings, seeds 1-4 in each cell densely covered with short rigid hairs, albumen fleshy, radicle superior, cotyledons foliaceous. A tree, leaves alternate entire 5-7 nerved, panicles terminal and axillary, flowers numerous, white. (Espera, *Willd.* Hexagonotheca, *Turcz.*)

BERRYA AMMONILLA. (Roxb.) Trunk tolerably straight, with smooth light brown bark and an extensive dense shady head, leaves alternate petioled, cordate sometimes slightly scoloped 5-7 nerved acute smooth on both sides, 4-8 inches long, petioles rather shorter than the leaves, slender round smooth and often colored, stipules ensiform, panicles terminal and axillary large ramose bearing numerous elegant middle-sized white flowers; calyx 1 leafed downy outside, splitting irregularly into 3-4-5 segments permanent, petals 5 spreading linear oblong double the length of the calyx or more, filaments numerous half the length of the petals, authers incumbent 2 lobed, ovary superior hairy ovate 3 lobed 3 celled, with 6-8 ovules in each, attached in 2 vertical rows to the axis, style short stigma 3 -cleft capsule 6-winged, &c., as in the genus. *Roxb. Fl. Ind.* ii. 639.

This is the tree which yields the well known Trincomalee wood; it is indigenous in Ceylon, where it is called Halmillilla (hence Roxburgh's specific name Ammonilla), and is not uncommon in the Madras Presidency in a cultivated state, though I have never met with it wild; its timber is strong, tolerably light, flexible and straight grained easily worked, of a pale red color fading to light brown, and very superior for direct cohesive strength; it is used for shafts, spokes of wheels and framing of carriages, handles and helves, and answers all the purposes of Ash in England; its specific gravity is ·800, *unseasoned it weighs* 58 *to* 60 *lbs. the cubic foot and* 50 *lbs. seasoned, it is largely imported into Madras from Ceylon in logs from* 18 *to* 25 *feet long and* 2½ *to* 5 *feet in girth.*



Govindoo, del.

Berraya Ammonilla (Roxb.)

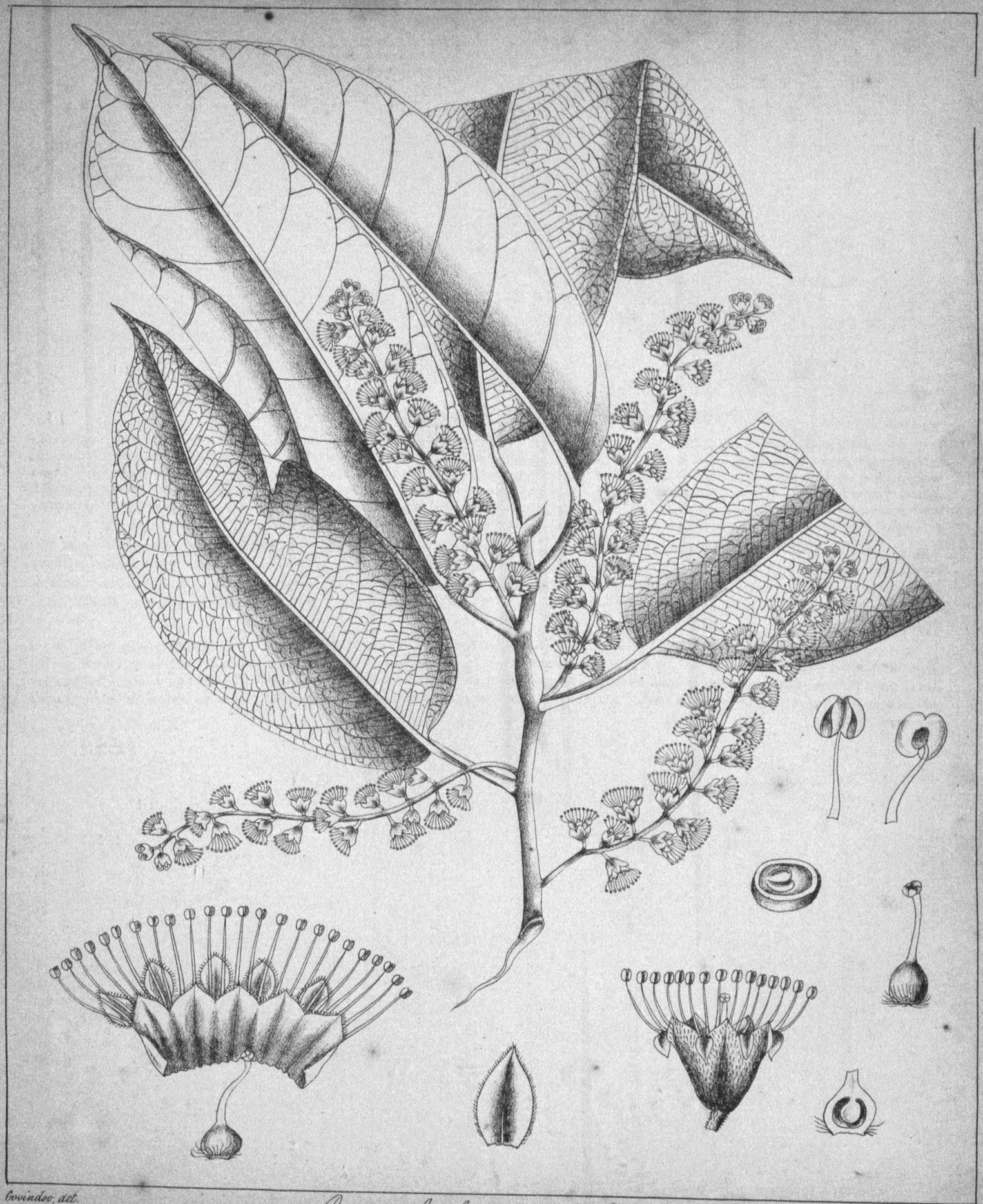
Dumphy, Lith.

PYGEUM CEYLANICUM. (Nat. ord. Rosaceæ, Tribe Pruneæ.)

PYGEUM. (Gærtn.) *Gen. Pl.* 1. *p.* 610.—GEN CHAR. Flowers sometimes polygamo-diœcious, calyx deciduous, tube broadly campanulate or spreading, teeth 5-6 (rarely more or none) small, petals as many, usually resembling the calyx-teeth inserted into the throat of the tube of the calyx, stamens 12-20 inserted with the petals, filaments filiform, anthers didymous, ovary superior sessile of a single carpel attenuated into a terminal style, stigma peltate, ovaries 2, pendulous, fruit dry coriaceous or drupaceous usually as broad as or broader than long with a smooth kernel, containing a single seed, cotyledons very thick, radicle superior. Trees, leaves alternate simple entire coriaceous, stipules small very deciduous, racemes axillary or lateral solitary or fascicled, flowers small. (Polydontia, *Blume Bijd.* 1104. Polystorthia, *Bl. Fl. Jav. Præf.* VIII.)

PYGEUM CEYLANICUM. (Gærtn.) A gigantic tree, leaves from elliptic, very obtuse at both ends, to sub-orbicular glabrous, when dry of a rusty brown beneath, 4-7 inches long by 2-3 broad, petioles ½ inch long, racemes shorter than the leaves, axillary solitary, covered with short adpressed hairs, flowers small, petals 5 reflexed, externally hairy round the margin, drupe shortly tomentose at length subglabrous.—*Gært. Frut.* i. 218. *t.* 46. Polyodontia? Walkerii. *Wight Ill.* i. 203. Pygeum acuminatum, *Coleb. Linn. Trans.* XII. 360. *t.* 18.

This tree is common on the Anamallays, and I have also met with it on the Shevaroys and on the Pulneys and Tinnevelly ranges; in the Anamallay sholas at an elevation of 4,000 feet it grows to an immense size and occasionally has very large buttresses, I have seen trees much over 20 feet in girth with an enormous spreading head. Nothing is known of its timber in this Presidency, it is reddish colored and apparently adapted for cabinet purposes, and the tree has no native name; it is also found in Ceylon, where it is called Galmora; the seed when bruised has a strong smell of prussic acid.



Govindoo, del.

Dumphy, Lith.

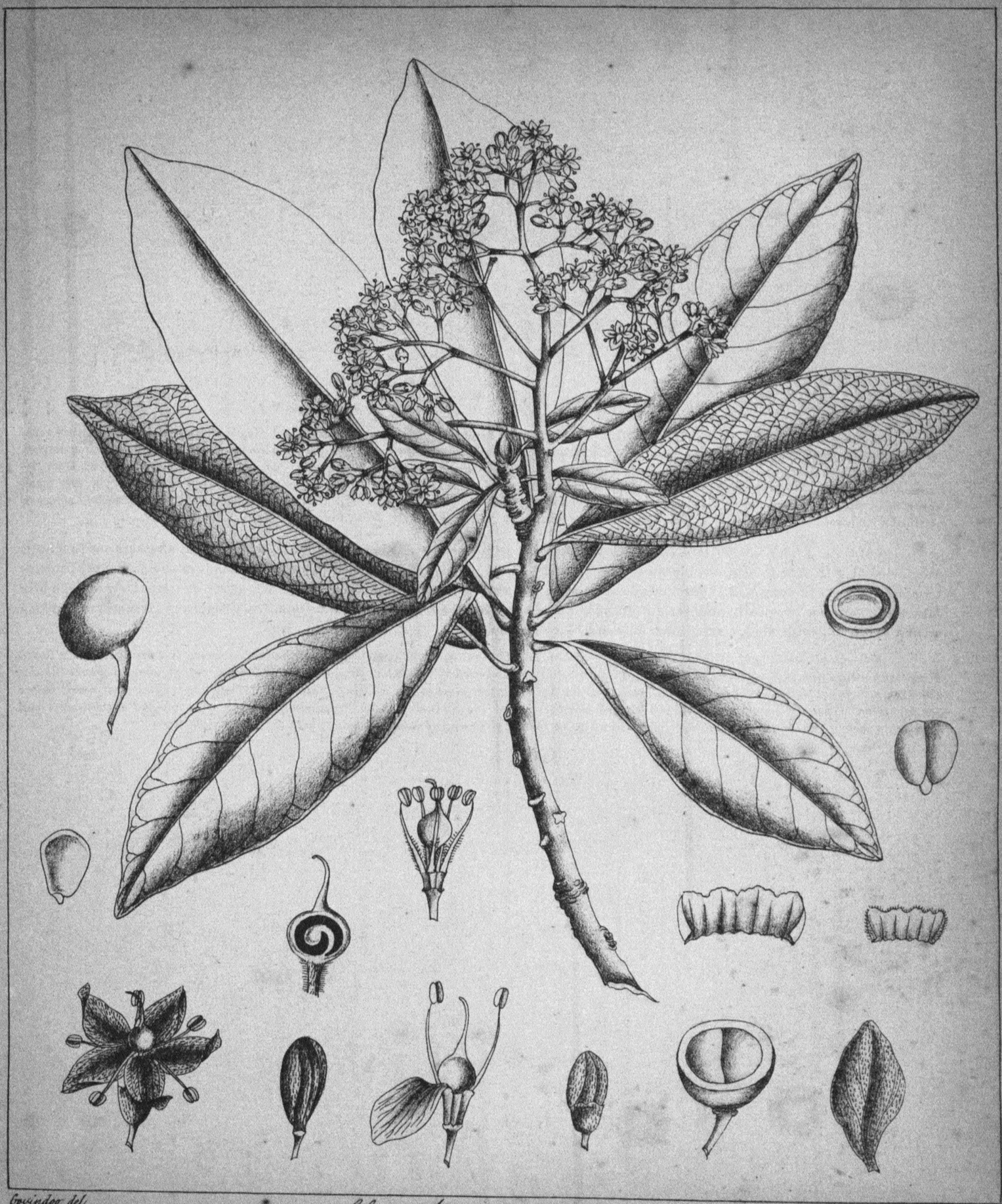
Pygeum Ceylanicum (Gærtn.)

GLUTA TRAVANCORICA (Nat. ord. Anacardiaceæ.)

GLUTA (Linn.) *Gen. Pl.* 1. 421.—GEN. CHAR. Flowers hermathrodite, calyx spathaceous, splitting irregularly, caducous, petals 5 rarely 4-6 attached to the base of the torus spreading imbricate, torus stipitiform, stamens 4-6 equal inserted on to the torus above the petals, filaments free, ovary stipitate, depressed globose oblique 1 celled, style lateral or terminal filiform stigma simple, ovule pendulous from the funicle which rises from the base of the cell, fruit baccate pedicellate, with a rough brownish rind, seed shaped to the cell, cotyledons very large connate fleshy, radicle very small obtuse incurved. Trees, with caustic juice, leaves alternate towards the apex of the branches shortle petiolate simple oblong coriaceous, panicles axillary or terminal. (Syndesmis, *Wall, in Roxb. Fl. Ind.* ii. *p.* 314. Stagmaria, Jack, Mal. Misc. *Ex. Hook, Comp. Bot. Mag.* 1. 267.)

GLUTA TRAVANCORICA (Bedd.) A very large tree, leaves crowded about the apex of the branches alternate entire elliptic attenuated at both ends to obovato-elliptic, 4-6 inch long by 1½—1¾ broad, glabrous on both sides, petioles very short dilated, panicles terminal and from the upper axils crowded canescent with very short adpressed pubescence, calyx sub-entire or irregularly and slightly 5-toothed, splitting irregularly and early caducous, bracts ovate cymbiform, petals 5 imbricate, fruit depressed transversely oblong with a rough brownish rind, about 1 inch long and 1¼ to 1½ broad.

Mr. Athol MacGregor, now the Collector of Malabar, first brought this tree to my notice as a valuable timber tree growing on the South Tinnevelly mountains and known as the Shen kurani. It is the first species of the genus found on the continent, though about 6 species inhabit the Archipelago, its timber is reddish in color, weighs 40 lbs. the cubic foot when seasoned, has a fine grain, takes a good polish and is well suited for furniture. The tree is most abundant in the dense moist forests on the Tinnevelly and Travancore chain of ghats above Paupanassum and grows to a very large size, trees having been observed up to 15 feet in girth and of immense height with a very straight stem.



Govindoo, del.

Dumphy, lith.

Gluta Travancorica (Bedd.)

FORESTER'S MANUAL OF BOTANY
FOR SOUTHERN INDIA.

This Manual is drawn up to assist Forest Officers in the determination of the trees of their districts, and will only treat of the trees and large shrubs; herbaceous plants shrubs attaining no size and creepers will not be described, and Orders or Genera only containing such (as for instance Ranunculace and Ranunculus) will be excluded.

CLASS I.—DICOTYLEDONS.

First rudimentary leaves of the embryo opposite, leaves irregularly net veined. Stem consisting of a pith in the centre and of concentric circles containing fibrous tissue increasing indefinitely by additions to the outside, and of bark on the outside; calyx and corol usually tetramerous or pentamerous

The above characters are all that are constant to separate Dicotyledons from Monocotyledons, these two great classes have however each a peculiar habit which is easily recognized. All Indian trees or shrubs except Palms, Screw pines and Bamboos are Dicotyledons.

SUB-CLASS 1.—POLYPETALÆ.

Petals distinct rarely wanting or connate at the base.

COHORT I. RANALES.—*Stamens indefinite, hypogynous, carpels distinct free or immersed singly in the torus, rarely connate below, albumen usually copious embryo relatively small.*

i. DILLENIACEÆ.—Leaves alternate simple exstipulate often scabrid, stipules none, sepals persistent, seeds arillate.

1 Dillenia. 2 Wormia.

ii. MAGNOLIACEÆ.—Sepals and petals forming three or more series and imbricate in each series. Carpel indefinite.

3. Michelia.

iii. ANONACEÆ.—Leaves alternate entire exstipulate, calyx and corol trimerous, carpels generally indefinite rarely definite or solitary, albumen ruminate.

4 Sagerœa.
5 Popowia.
6 Goniothalamus.
7 Mitrephora.
8 Anona.
9 Xylopia.
10 Cyathocalyx.
11 Unona.
12 Polyalthia.
13 Phœanthus.
14 Saccopetalum.
15 Miliusa.
16 Alphonsea.
17 Orophea.

iv. MENISPERMACEÆ.—Leaves alternate exstipulate usually palminerved, flowers small diœcious, stamens 6 (3-9) free or connate.

18 Cocculus.

v. BERBERIDACEÆ.—Leaves pinnate or unifoliate, sepals petals and stamens each in 2 or 3 series of 3 each, anthers dehiscing by valves, carpel 1.

19 Berberis.

COHORT II. PARIETALES.—*Stamens definite or indefinite hypogynous, ovary syncarpous with parietal placentation, one celled or spuriously divided by cellular placentary dissepiments, ovules rarely solitary.*

vi. CAPPARIDACEÆ.—Leaves alternate simple or multifoliate, stipules often aculeate, petals 4, stamens indefinite rarely definite ovary often stipitate, albumen none.

20 Capparis. 21 Cratœva.

vii. MORINGACEÆ.—Leaves 2-3-pinnate alternate, stamens 5 or 10, albumen none.

22 Moringa.

viii. BIXINEÆ.—Leaves alternate simple, stipules none or minute (rarely conspicuous.)

23 Cochlospermum.
24 Scolopia.
25 Flacourtia.
26 Hydnocarpus.
27 Aberia.
28 Erythrospermum.
29 Trichadenia.

COHORT III. POLYGALINEÆ.—*Sepals 5 unequal or equal, petals 5 stamens 5 6 or 8 free or monadelphous hypogynous, ovary 2 merous.*

ix. PITTOSPOREÆ.—Leaves alternate entire exstipulate, flowers regular.

30 Pittosporum.

x. POLYGALEÆ.—Leaves alternate entire, exstipulate, flowers irregular.

31 Xanthophyllum.

COHORT IV. CARYOPHYLLINEÆ.—*Sepals 2-4-5 free or connate, petals 5 rarely fewer or none occasionally minute, stamens 5-10 or many hypogynous, ovary 1 celled with free central or more or less septate placentation, albumen mealy.*

xi. TAMARISCINEÆ.—Slenderly branched with minute or rudimentary alternate leaves, sepals and petals each 4-6.

32 Tamarix.

COHORT V. GUTTIFERALES.—*Sepals 2-6 or more imbricate, petals as many rarely more, stamens indefinite hypogynous, ovary usually syncarpous with axile placentation.*

xii. GUTTIFERÆ.—Usually abounding in a yellow or greenish resinous juice, leaves opposite entire, flowers usually diœcious, or polygamous, stamens indefinite free or variously connate.

33 Garcinia. 35 Calophyllum. 37 Mammea.
34 Xanthochymus. 36 Mesua.

xiii. TERNSTRÆMIACEÆ.—Leaves alternate rarely opposite? simple, flowers hermathrodite, stamens indefinite free or connate at the base.

38 Ternstræmia. 40 Eurya 42 Pœciloneuron.
39 Adinandra. 41 Gordonia.

xiv. DIPTEROCARPEÆ.—Leaves alternate entire penniveined, flowers hermathrodite, calyx lobes usually enlarged in fruit

43 Dipterocarpus. 45 Shorea. 47 Doona. 49 Monoporandra.
44 Vatica. 46 Hopea. 48 Vateria.

COHORT VI. MALVALES.—*Sepals or calyx lobes valvate, petals as many as sepals or none, stamens monadelphous or free hypogynous ovary syncarpous with axile placentation.*

xv. MALVACEÆ.—Leaves alternate, stamens monadelphous with 1 celled anthers.

50 Kydia. 52 Dicellostyles. 54 Adansonia. 56 Eriodendron.
51 Julostyles. 53 Thespesia. 55 Bombax. 57 Cullenia.

xvi. STERCULIACEÆ.—Leaves alternate, stamens monadelphous, indefinite or definite, or free and definite with or without alternating staminodia, anthers 2 celled.

58 Sterculia. 60 Kleinhovia. 62 Eriolæna. 64 Guazuma.
59 Heritiera. 61 Pterospermum. 63 Abroma.

xvii. TILIACEÆ.—Leaves alternate, stamens indefinite free or shortly connate at the base, anthers 2 celled.

65 Pityranthe. 66 Berrya. 67 Grewia. 68 Erinocarpus. 69 Elæocarpus.

COHORT VII. GERANIALES.—*Ovary more or less deeply sulcate or lobed, or entire (in Lineæ Burseraceæ Meliaceæ and Chailletiaceæ) stamens hypogynous, ovules 1-2 or rarely indefinite pendulous with a ventral raphe.*

xviii. LINEÆ.—Leaves simple alternate, ovary undivided, styles free or connate, ovules 1 or 2 in each cell.

70 Erythroxylon.

xix. GERANIACEÆ.—Leaves alternate or opposite usually stipulate not pellucid dotted, stamens 5-10-15 all or only part antheriferous, ovary lobed, ovules 1-2 or many, fruit usually with a central prominent beak.

71 Averrhoa.

xx. RUTACEÆ.—Leaves opposite or alternate simple or compound, exstipulate gland dotted, ovary lobed usually surrounded by or inserted upon a fleshy disk, ovules 1-2 in each cell.

72 Evodia. 75 Glycosmis. 78 Clausæna. 81 Feronia.
73 Zanthoxylon. 76 Limonia. 79 Atlantia. 82 Ægle.
74 Acronychia. 77 Murraya. 80 Citrus.

xxi. SIMARUBEÆ.—Leaves alternate simple or compound eglandular, bitter to the taste, filaments usually pilose or with an adnate scale, ovary lobed, ovules 1-2 in each cell.

83 Ailanthus. 84 Samadera. 85 Balanites.

xxii. OCHNACEÆ.—Leaves alternate glabrous simple penniveined stipulate, stamens 10 or indefinite, anthers linear often elongate, ovary deeply lobed, fruit carpels distinct drupaceous.

86 Ochna. 87 Gomphia.

xxiii. BURSERACEÆ.—Usually abounding in resin, leaves alternate, exstipulate 3 foliate or pinnate, rarely 1 foliate, ovary entire, ovules 2 or 1 in each cell, albumen none.

88 Boswellia. 90 Balsamodendron. 92 Bursera. 94 Filicium.
89 Garuga. 91 Protium. 93 Canarium.

xxiv. MELIACEÆ.—Leaves alternate exstipulate compound, stamens 8-10, ovary entire, ovules 2-4 to 10 in each cell.

95 Melia. 99 Milnea. 103 Heynea. 107 Cedrela.
96 Mallea. 100 Lansium. 104 Beddomea. 108 Chloroxylon.
97 Dysoxylum. 101 Amoora. 105 Soymida.
98 Sandoricum. 102 Walsura. 106 Chickrassia.

xxv. CHAILLETIACEÆ.—Leaves alternate entire stipulate, petals bifid, ovary entire, ovules 2 in each cell.

109. Chailletia.

COHORT VIII. OLACALES.—*Ovary entire 1 many celled, stamens hypogynous or subhypogynous, ovules 1-3 in each cell pendulous, with a dorsal raphe, seeds usually albuminous.*

xxvi. OLACINEÆ.—Leaves alternate simple exstipulate, petals free or connate usually valvate, ovary 1 or imperfectly 3 5 celled, ovules usually solitary in each division of the ovary, albumen rarely wanting.

110 Ximenia. 112 Anacolosa. 114 Gomphandra. 116 Mappia.
111 Strombosia. 113 Lasianthera. 115 Apodytes.

xxvii. ILICINEÆ.—Leaves alternate simple exstipulate, petals imbricate, ovary 3-6 celled, albumen copious.

117. Ilex.

COHORT IX. CELASTRALES.—*Disk fleshy free or adnate to the calyx tube, stamens rarely more than the petals, inserted around or within the margin of the disk or hypogynous, ovules erect, flowers small usually hermathrodite.*

xxviii. CELASTRACEÆ.—Leaves opposite or alternate simple, petals imbricate, stamens alternate with the petals or only 3.

118 Euonymus.	121 Lophopetalum.	124 Celastrus.	127 Elæodendron.
119 Glyptopetalum.	122 Kokoona.	125 Gymnosporia.	128 Hippocratea.
120 Microtropis.	123 Pleurostylia.	126 Kurrimia.	129 Salacia.

xxix. RHAMNACEÆ.—Leaves simple, calyx lobes valvate, petals small concave, stamens opposite to the petals.

130 Zizyphus.	131 Scutia.	132 Sageretia.	133 Colubrina.

COHORT X. SAPINDALES.—*Disk various, stamens hypogynous or subhypogynous, ovary entire or lobed, ovules 1 or 2 in each cell ascending pendulous or laterally affixed rarely indefinite, flowers often unisexual or polygamous, leaves generally compound.*

xxx. SAPINDACEÆ.—Leaves alternate compound, style 1, ovules ascending or horizontal.

134 Hemigyrosa.	137 Anomosanthes.	140 Sapindus.	143 Pometia.
135 Schmidelia.	138 Schleichera.	141 Nephelium.	144 Harpullia.
136 Cupania.	139 Glennea.	142 Euphoria.	145 Dodonæa.

146. Turpinia.

xxxi. ANACARDIACEÆ.—Usually abounding in resinous juice, leaves simple alternate or pinnate, often tufted at the ends of the branches. Styles 1-4 or stigmas subsessile, ovules solitary suspended or laterally affixed.

147 Mangifera.	150 Solenocarpus.	153 Drimycarpus.	156 Campnosperma.
148 Anacardium.	151 Odina.	154 Holigarna.	157 Spondias.
149 Buchanania.	152 Semecarpus.	155 Nothopegia.	158 Rumphia.

xxxii. SABIACEÆ.—Stamens often unequal in size and some imperfect, equal in number to the petals and opposite to them, leaves simple or pinnate.

159. Meliosma.

COHORT XI. ROSALES.—*Flowers regular or irregular usually hermathrodite, stamens more or less distinctly perigynous, styles distinct.*

xxxiii. CONNARACEÆ.—Leaves 1-3 foliate or pinnate, flowers regular, stamens definite, carpels free 1-5, ovules 2 ascending orthotropous.

160 Connarus. 161 Ellipanthus.

xxxiv. LEGUMINOSÆ.—Leaves usually compound, flowers irregular or regular, stamens definite or indefinite free or connate carpel solitary, ovules 1-2 many anatropous or amphitropous attached to a ventral suture.

Papilionaceæ.

162 Indigofera.	166 Æschynomene.	170 Butea.	174 Calpurnia.
163 Tephrosia.	167 Ougeinia.	171 Dalbergia.	175 Sophora.
164 Mundulea.	168 Desmodium.	172 Pterocarpus.	176 Ormosia.
165 Sesbania.	169 Erythrina.	173 Pongamia.	177 Pericopsis.

Cæsalpiniæ.

178 Cæsalpinia.	181 Cassia.	184 Humboldtia.	187 Crudia.
179 Acrocarpus.	182 Dialium.	185 Tamarindus.	188 Hardwickia.
180 Poinciana.	183 Bauhinia.	186 Saraca.	189 Cynometra.

Mimosæ.

190 Parkia.	193 Dichrostachys.	196 Acacia.
191 Adenanthera.	194 Mimosa.	197 Albizzia.
192 Prosopis.	195 Xylia.	198 Pithecolobium.

xxxv. ROSACEÆ.—Flowers regular, petals imbricate, stamens indefinite very perigynous.

199 Parinarium.	200 Pygeum.	201 Cotoneaster.	202 Photinia.

COHORT XII. MYRTALES.—*Flowers regular or subregular generally hermathrodite, ovary syncarpous, placentas axile, leaves simple entire rarely toothed.*

xxxvi. RHIZOPHOREÆ.—Sepals valvate, stamens various, ovary inferior or partly so, ovules few pendulous, albumen none or fleshy, leaves opposite or very rarely alternate, exstipulate.

203 Rhizophora	205 Kandelia.	207 Carallia.	209 Anisophyllea.
204 Ceriops	206 Bruguiera.	208 Blepharistemma.	

xxxvii. COMBRETACEÆ.—Calyx lobes various, stamens often definite, ovary 1-celled, ovules pendulous, albumen none, leaves opposite or alternate exstipulate.

210 Terminalia.	211 Calycopteris.	212 Anogeissus.	213 Gyrocarpus.

xxxviii. MYRTACEÆ.—Calyx lobes imbricate or open, petals imbricate, stamens indefinite, ovary inferior, albumen none, placentas subbasal, leaves dotted exstipulate opposite or rarely alternate.

214 Psidium.	216 Nelitris.	218 Barringtonia.
215 Rhodomyrtus.	217 Eugenia.	219 Careya.

xxxix. MELASTOMACEÆ.—Calyx lobes generally imbricate or open, ovary within the calyx tube free or adnate, petals contorted, stamens definite curved down in bud, albumen none, leaves opposite exstipulate.

220. Memecylon.

xl. LYTHRARIEÆ.—Calyx lobes valvate, petals crumpled inserted on to the border of the calyx tube, ovary within the calyx tube but free 2-many celled, cells many ovuled, albumen none, leaves opposite or rarely alternate exstipulate.

221 Lawsonia. 223 Soneratia. 225 Axinandra.
222 Lagerstræmia. 224 Punica.

COHORT XIII. PASSIFLORALES.—*Flowers regular or rarely irregular, ovary syncarpous, placentas parietal, leaves entire lobed or cut.*

xli. SAMYDACEÆ.—Petals persistent with the sepals or none, stamens indefinite or anisomerous or opposite the petals, albumen copious, leaves alternate undivided, stipules minute.

226 Casearia. 227 Osmelia. 228 Homalium.

xlii. DATISCEÆ.—Flowers unisexual, segments of the calyx small 4, petals none, stamens 4 in male, ovary inferior, leaves alternate.

229. Tetrameles.

COHORT XIV. UMBELLALES.—*Flowers regular, ovary inferior 2 many rarely 1 celled, ovules solitary in the cells pendulous styles distinct or joined at the base on an epigynous disk, stamens definite, albumen copious.*

xliii. ARALIACEÆ.—Fruit succulent not separating, cells usually more than 2, leaves alternate often compound.

230 Pentapanax. 231 Polyscias. 232 Heptapleurum.

xliv. CORNACEÆ.—Fruit succulent 2 celled, leaves opposite or alternate and undivided, stamens alternate with the petals.

233 Alangium. 234 Mastixia.

SUB-CLASS 2.—MONOPETALAÆ.

Petals united at least at the base into a single corol.

COHORT XV. CINCHONALES.—*Corol epigynous bearing the stamens.*

xlv. CAPRIFOLIACEÆ.—Leaves opposite without stipules, ovary 2 or more celled.

235 Viburnum. 236 Dichilanthe. 237 Lonicera.

xlvi. RUBIACEÆ.—Leaves opposite with stipules (stipules sometimes leaf-like in a whorl with the leaves), ovary 2 or more celled

238 Nauclea.
239 Uncaria.
240 Hymenodyction.
241 Morinda.
242 Mephitidea.
243 Grumilea.
244 Serissa.
245 Hamiltonia.
246 Canthium.
247 Timonius.
248 Guettardia.
249 Coffea.
250 Ixora.
251 Pavetta.
252 Discospermum.
253 Stylocoryne.
254 Griffithia.
255 Randia.
256 Gardenia.
257 Wendlandia.

xlvii. COMPOSITÆ.—Florets in compact heads, anthers united in a ring round the style, ovary 1 celled 1 ovuled.

255 Vernonia. 256 Monosis.

COHORT XVI. ERICALES.—*Stamens free from the corol.*

xlviii. ERICACEÆ.—Stamens usually twice as many as corol lobes, anthers opening by terminal pores.

260 Vaccinium. 261 Rhododendron.

COHORT XVII. SAPOTALES.—*Corol hypogynous or rarely perigynous bearing the stamens, which are either opposite the corol lobes or more than their number.*

xlix. MYRSINACEÆ.—Stamens opposite the corol lobes, placenta free and central, fruit a berry.

262 Ardisia. 263 Mæsa. 264 Myre.

l. SAPOTACEÆ.—Stamens opposite the corol lobes or twice as many, ovary 2 or more celled, ovules 1 or 2 in each.

265 Bassia.
266 Isonandra.
267 Mimusops.
268 Sapota.
269 Sideroxylon.
270 Chrysophyllum.

li. EBENACEÆ.—Flowers usually diœcious, stamens indefinite, ovary 3 or more celled, ovules 1-2 in each cell.

271 Diospyros. 272 Maba.

lii. STYRACEÆ.—Stamens twice as many as the corol lobes, or more, ovary more or less inferior 2 or more celled, ovules 2 or more in each cell.

273 Symplocos.

COHORT XVIII. BORAGINALES.—*Corol regular hypogynous or rarely perigynous bearing the stamens, which alternate with its lobes and equal them in number (except in Jasminaceæ.)*

liii. JASMINACEÆ.—Stamens 2.

274 Ligustrum.
275 Linociera.
276 Olea.
277 Nyctanthes.
278 Chionanthus.
279 Schrebera.

liv. APOCYNACEÆ.—Carpels 2 usually distinct, stigmas united, filaments distinct.

280 Alstonia.
281 Carissa.
282 Ophioxylon.
283 Cerbera.
284 Plumieria.
285 Tabernamontana.
286 Wrightea.
287 Holarrhena.
288 Nerium.

lv. LOGANIACEÆ.—Stamens free, ovary 2 or more celled, placentas axile, leaves opposite sometimes stipulate.

289 Strychnos. 290 Buddleia. 291 Fagræa.

lvi. BORAGINACEÆ.—Fruit 2 or 4 seeded, either 2 or 4 lobed or of 2 or 4 nuts, leaves alternate usually rough.

292 Cordia. 293 Ehretia.

lvii. SALVADORACEÆ.—Ovary superior 1 celled, ovule solitary erect, leaves opposite.

294 Salvadora.

COHORT XIX. BIGNONALES.—*Flowers irregular, stamens 1 less, or 3 less than the corol lobes, or 5 unequal and 1 or 3 sterile.*

lviii. BIGNONIACEÆ.—Fruit capsular 2 valved 2 celled, seeds winged, without albumen, cotyledons large leafy.

295 Bignonia.	297 Millingtonia.	299 Stereospermum.
296 Calosanthes.	298 Spathodea.	300 Pajanelia.

301. Heterophragma.

lix. VERBENACEÆ.—Fruit composed of 2-4 nucules in a state of cohesion, with 1 seed in each, style terminal.

302 Tectona.	304 Callicarpa.	306 Vitex.
303 Premna.	305 Clerodendron.	307 Gmelina.

SUB CLASS III.—MONOCHLAMYDEÆ.

Perianth really or apparently simple or none (except in some Euphorbiaceæ).

lx. LAURINEÆ.—Anther cells opening by valves turned upwards. Perianth-segments usually six, berry or drupe 1 seeded, no albumen.

308 Cinnamomum.	311 Beilschmiedia.	314 Litsœa.	317 Haasia,
309 Apollonias.	312 Cryptocarya.	315 Actinodaphne.	318 Cylicodaphne.
310 Phœbe.	313 Tetranthera.	316 Alseodaphne.	319 Machilus.

lxi. PROTEACEÆ.—Perianth inferior, segments 4 valvate with a stamen on each, no albumen.

320 Helicia.

lxii. SANTALACEÆ.—Perianth wholly or partially superior, lobes valvate, stamens opposite the lobes, ovary 1 celled with 3-5 suspended ovules.

321 Santalum 322 Pyrularia.

lxiii. EUPHORBIACEÆ.—Flowers unisexual, ovary of 3 rarely 2 or more than 3 united carpels, with 1 or 2 pendulous ovules and usually separating into cocci, seeds albuminous.

323 Euphorbia.	332 Gelonium.	341 Briedelia.	350 Bischoffia.
324 Sapium.	333 Miscodon.	342 Amanoa.	351 Pierardia.
325 Exœcaria.	334 Croton.	343 Actephila.	352 Cyclostemon.
326 Falconeria.	335 Jatropha.	344 Emblica.	353 Hemicyclia.
327 Cleidion.	336 Dimorphocalyx.	345 Phyllanthus.	354 Putranjiva.
328 Trewia.	337 Desmostemon.	346 Melanthesa.	355 Aporosa.
329 Rottlera.	338 Givoytia.	347 Cicca.	356 Antidesma.
330 Macaranga.	339 Sarcoclinium.	348 Prosorus.	357 Daphniphyllum.
331 Aleurites.	340 Agrostistachys.	349 Glochidion.	

lxiv. THYMELEÆ.—Perianth lobes imbricate, stamens as many or twice as many inserted in the tube, ovary 1 or 2 celled with one pendulous ovule in each, style 1.

358 Lasiosiphon. 359 Hernandia.

lxv. URTICACEÆ.—Flowers unisexual, males small, green not in catkins, stamens opposite to the perianth segments, ovary free, ovule 1 (or if 2, one always abortive), styles 2, or rarely 1 unilateral.

360 Bœhmeria.	364 Streblus.	368 Ulmus.
361 Morocarpus.	365 Taxotrophis.	369 Celtis.
362 Artocarpus.	366 Antiaris.	370 Sponia.
363 Plecospermum.	367 Ficus.	371 Gironniera.

lxvi. MYRISTICACEÆ.—Perianth united into a valvate cup, leaves alternate entire, stamens monadelphous, ovary free 1 celled with 1 erect ovule, albumen copious ruminate.

372 Myristica.

lxvii. SALICACEÆ.—Flowers diclinous in catkins, stamens 2 or more, ovary 1 celled, ovules many, seeds cottony, leaves alternate.

373 Salix.

lxviii. CASUARINACEÆ.—Flowers diclinous in catkins, stamen 1, female flowers in dense heads, ovary 1 celled, ovule 1 obliquely ascending.

374 Casuarina.

SUB CLASS IV.—GYMNOSPERMÆ.

Ovules and seeds naked, without ovary or styles.

lxiv. CYCADACEÆ.—Leaves parallel veined pinnate, scales of the cone antheriferous.

375 Cycas.

lxx. CONIFERÆ.—Leaves simple acerose, females in cones.

376 Podocarpus.

Shemboo in Tamil; the timber is close grained and heavy, very ornamental and beautifully mottled, it is used for cabinet purposes and furniture, the bark and all parts of the tree are very astringent, and used medicinally by the natives. There is an enormous show tree of this species on the Balarangums, about four miles from the Mysore Cinchona Gardens, it is upwards of fifty feet in circumference at the base but soon branches into 18 or 20 large stems, each of which are several feet in girth; it is visited by a great many natives, and is self-established, as it is in a remote part of the forest on the banks of a stream.

ORDER III.—ANONACEÆ.

Sepals three distinct, or more or less connate, or combined into a regular cup, (in Cyathocalyx), petals six in two series or very rarely three, one series being suppressed, free or shortly connate at the base valvate or imbricate, stamens indefinite numerous, or rarely definite (in Orophea) free, usually closely imbricate upon a convex or rarely plane torus or laxly imbricate (in Miliuseæ), filaments short or 0 anthers adnate linear cuneate or quadrate, the connective usually produced or truncate and dilated above the cells, pistil of several or numerous free carpels, rarely of only one (Cyathocalyx) or the ovaries cohering or separately imbedded in the fleshy torus (Anona) stigmas capitate sessile, the styles ovate oblong linear or subulate, usually sulcate and stigmatose at the apex or along the inner face, ovules 1-2 or more basal or erect or attached to the ventral suture in one or two series, fruit carpels distinct, one or several seeded sessile or stipitate usually indehiscent or separately immersed in a pulpy or coriaceous fruit (Anona) seeds with copious ruminated albumen, with or without an arillus, embryo minute near the hilum. Trees or shrubs, (or climbing plants) leaves alternate simple entire exstipulate, flowers axillary terminal or variously extra-axillary solitary or fascicled rarely cymosely racemose or panicled, sessile or pedicellate, hermathrodite or rarely unisexual.

This Order is very abundantly represented in the moist western forests of this Presidency, but most of the species are only very small, trees or large shrubs and of no importance to the Forester. The following are the only species in this Presidency that grow to be trees of any size

Miliusa velutina found in the dry forests of the eastern side of the Presidency. Polyalthia longifolia, abundant as a planted tree. Polyalthia cerasoides in dry forests on both sides of the Presidency. Saccopetalum tomentosum in dry forests on the western side. Alphonsea 3 species on both sides of the Presidency in moist forests, or ravines on the banks of streams (Cuddapah and N. Arcot.) Mitrephora grandiflora, Polyalthia fragrans and coffeoides in moist forests only on the western side, all which except two of the Alphonseas will be figured in the plates of this work, and of the other less important genera dissections are here given; these latter are as follows: Sageræa two small trees yielding handsome wood, both rare in the dense moist forests at about 2,000 feet elevation. Cyathocalyx, one tolerably large tree in sholas on most of our western mountains. – Unona, three unimportant shrubs or small trees. Polyalthia three shrubs. Popowia, one shrub or small tree. Goniothalamus, several small trees and shrubs. Mitrephora one small tree. Phœanthus one large shrub. Miliusa several large shrubs. Orophea one tree and several shrubs, all of which are only found in the moist forests on the western side of our Presidency, generally at about 2,000 to 3,000 feet elevation, never above 5,000 feet and seldom above 4,000; and Anona, three small fruit trees introduced, one of which has run wild all over the country.

Conspectus of the Tribes.

A. Carpels joined into a many celled fruit ... ... Anoneæ.
B. Carpels distinct.
  a. Petals imbricate ... ...Uvarieæ.
  b. Petals valvate.
    α. Stamens loosely imbricate, anthers conspicuous in the flower ... ...Miliuseæ.
    β. Stamens closely packed, connective generally only visible.
      i. Interior petals unguiculate ... ...Mitrephoreæ.
      ii. Interior petals not unguiculate.
        1. Interior petals thick triquetrous ... ...Xylopieæ.
        2. Interior petals nearly similar to the exterior ... ...Unoneæ.

Conspectus of the Genera.

i. Uvarieæ.
  Stamens definite ... ...Sageræa.
ii. Mitrephoreæ.
  A. Ovule solitary or 2 from the ventral suture, inner petals nearly as large as the outer.Popowia.
  B. Ovules 2 or solitary from the ventral suture, inner-petals very much smaller than the outer... ... ...Goniothalmus.
  C. Ovules indefinite ... ...Mitrephora.
iii. Anoneæ. ... ...Anona.
iv. Xylopieæ. ... ...Xylopia.
v. Unoneæ.
  A. Ovary solitary ... ...Cyathocalyx.
  B. Ovaries many.
    α. Petals nearly equal.
      1. Ovules 2 8 regularly placed on the ventral suture ... ...Unona.
      2. Ovule 1 erect from the base ... ...Polyalthia.
    β. Interior petals much smaller than the exterior ... ...Phœanthus.
vi. Miliuseæ.
  A. Exterior petals minute.
    α. Ovules in 2 series 6 or more ... ...Saccopetalum.
    β. Ovules in 1 series 1-2 ... ...Miliusa.
  B. Petals nearly equal.
    α. Ovules in 2 series ... ...Alphonsea.
    β. Ovules in 1 series ... ...Orophea.

SAGERÆA. DALZ.

Sepals 3 rotundate imbricate, petals 6 orbicular slightly fleshy concave imbricate in 2 series, stamens 12 28, carpels 3-6 ovules numerous in 2 series. Trees, leaves coriaceous shining very glabrous.

SAGERÆA DALZELLII. (Bedd. Icones Pl. Ind. p. 9. t. xlii.) Sepals cohering into a 3-lobed calyx, lobes rounded, stamens 28 all fertile, stigma entire.

A small handsome tree like a laurel with bright yellow flowers, in moist woods on the Anamallays at 2000 feet elevation.

2. SAGERÆA LAURINA DALZ.—Sepals imbricate, stamens 12 exterior ones sometimes sterile. *Dalz. H. f. et T. Fl Ind.* i. 93. An elegant middle sized laurel looking tree, with white flowers, found in the Concans and Canara, called Sajeree, yields a valuable reddish timber.

3. SAGERÆA THWAITESII. (H. f. et T.) Sepals imbricated short obtuse, stamens about 18, stigma 2-lobed. *H. f. et T. Fl. Ind.* 1, *p.* 93 ;—*Bedd. Icones. Pl. p.* 9. *t.* xli.

A small tree in Ceylon at about 1000 feet elevation, flowers pale yellow.

A fourth species of this genus, 4 *S. elliptica*, is a large tree in Tenasserim.

POPOWIA. ENDL.

Sepals 3 ovate valvate, petals 6 all nearly equal, thick ovate concave inflexed broadly unguiculate at the base, valvate, stamens 12-24 cuneate truncato-capitate, torus slightly elevated, ovaries 4-many, oval oblong, style large obovate recurved, ovules 1-2 erect or on the ventral suture, fruit globose or ovoid, trees or shrubs, flowers small axillary or leaf opposed.

1. POPOWIA RAMOSISSIMA. (Wall. Cat. 7294). Branches rugulose young parts ferrugineo-tomentose, leaves ovate or oblong punctate beneath, flowers densely tomentose exterior petals larger than the inner ones ; interior ones thick ovate concave, stamens about 24, ovaries 4-7, ovule solitary on the ventral suture.—*Bedd. Icones Pl. Ind. p.* 15. *t.* lxxv.

A small tree or large shrub on the South Tinnevelly and Travancore mountains, 3-5,000 feet elevation, very common just below Aghasteer peak.

GONIOTHALAMUS. BLUME.

Sepals 3 generally large valvate, petals 6 valvate in 2 series thickly coriaceous, exterior flat ovate or elongate, interior ones thick valvate broadly clawed and closely connivent into a mitreform cap, stamens numerous, ovaries numerous, ovules 2 or more rarely 1 on the ventral suture, carpels oblong 1 seeded, small trees or shrubs.

1. GONIOTHALAMUS WIGHTII. (H. f. et T.) A small tree, leaves glabrous narrow lanceolate 4-6 inch long by 1 inch broad, peduncles axillary solitary ½ an inch long, flowers ¾-1 inch long, sepals persistent ovate acute, exterior petals ovate shortly and broadly unguiculate, interior ½ an inch long, ovaries 14-18 sericeous, style elongate 2-clawed, ovules 1-2 from the ventral suture.—*H. f. et T. Fl. Ind. p.* 106 ;—*Bedd. Icones Pl. Ind. p.* 13. *Pl.* lxiii.

A small tree on the South Tinnevelly range, from 3,000 feet up to nearly 5,000 feet elevation.

2. GONIOTHALAMUS THWAITESII. (H. f. et T.) A middling sized or small tree, leaves oblong 3½-6 inch long by 1½-2½ broad rigid coriaceous glabrous peduncles axillary ⅔ to 1 inch long, flowers 1 inch long, exterior petals ovato-lanceolate glabrous thickly coriaceous with a short broad claw at the base, inner petals closely connivent into a mitreform cap, ovaries linear oblong strigose, style subulate longer than the ovary, ovules 2.—*H. f. et T. Fl. Ind. p.* 106 ;—*Bedd. Icones Pl.* 12. *t.* lviii.

A small or middling sized tree common in the moist forests on the South Tinnevelly and Travancore mountains at 3-4000 feet and also in Ceylon.

3. GONIOTHALAMUS HOOKERI. (Thw.) A middling sized tree, leaves ovato oblong slightly narrowed at the base smooth, 6-13 inch long by 2½-4½ broad, flowers pale green, sparingly rufo-hirsute, sepals persistent rotundate acute ¾ inch long, exterior petals 2 inch long, ¾ broad rotundate at the base slightly contracted above the middle, interior ones ¾ inch long, ovaries about 25, style long subulate, stigma small bipartite —*Thw. En. Pl. Zey. p.* 6 ;—*Bedd. Icones Pl. p.* 14 *t.* lxvi.

A tree about 30 feet high in Ceylon at about 1000 feet elevation.

4. GONIOTHALAMUS WALKERI. (H. f. et T). A small erect tree, leaves aromatic linear oblong acute at the base shortly and obtusely acuminate at the apex 8-13 inch long by 2-3 inch broad, glabrous and shining above, flowers reddish, sepals persistent broadly ovate, acute nerved 2-4 lines long torus subglobose a little thickened, exterior petals ovate lanceolate 8 lines long, interior ones 5 lines long, style clavate stigma 2 lobed.

A small tree in Ceylon (Singhe rajah forest) called Kappooroo. The fragrant roots contain camphor and are chewed by the Cinghalese.

5. GONIOTHALAMUS CARDIOPETALUS. (Dalz). Is a large shrub or very small tree abundant in the Wynad, Coorg and Canara ghats. 6. *G. Wynadensis* is a shrub in the Wynad, and 7. *G. Gardeneri*, 8. *Thomsoni*, 9. *salicinus*, and 10. *reticulatus* are all Ceylon shrubs ; they are all figured in the Icones Pl. Indiæ. 11. *G. Simonsii* is a small tree on the Khasya Hills, and 12. *G. sesquipedalis* a shrub found in Sylhet, Khasya and Tenasserim.

MITREPHORA.

For Gen. Char. see letter-press to plate of Mitrephora grandiflora.

1. M. GRANDIFLORA.—For description see plate.

2. M. HEYNEANA. (Thw.) A small tree, leaves glabrous coriaceous ovate to lanceolate 1½-3 inches long by 1 inch broad peduncles leaf opposed short 1-3 flowered, sepals rotundate puberulous on the outside deciduous in fruit, exterior petals 2-3 inches long cuneato-lanceolate acuminate puberulous on both sides, interior ones villous trapezoid acute with a claw nearly ½ an inch long, torus strigose, stamens numerous all fertile broadly cuniate, ovaries 6-9 densely strigose, 2-4 ovuled, carpel ovoid or subglobose ½ inch long, hoary.—*Thw. En. Pl. Zeyl. p.* 8 ;—*Bedd. Icones Pl. p.* 16. *t.* lxxvii. Orophea, *H. f. et T. Fl. Ind. p.* 110.

A small tree common about the foot of the Tinnevelly hills in Travancore and in Ceylon.

3. MITREPHORA TOMENTOSA is a tree found in Assam.

ANONA.

Flowers hermathrodite, sepals 3 usually small and valvate, free or connate below, petals 6, or the 3 inner suppressed, exterior petals fleshy or thick and coriaceous, concave at least at the base spreading or connivent, valvate ; interior petals when present valvate or imbricate towards their apices, stamens indefinite, the connective more or less thickened beyond the anther cells, ovate or truncate, torus hemispherical or conical ; ovaries indefinite connate or immersed, styles and oblong stigmas free, ovules solitary erect fruit multilocular. Trees or shrubs.

There are 3 fruit trees belonging to this genus, but they are all of American origin, though A. squamosa, the custard apple, is quite wild all over the country, often in out of way parts of the hills, the sour sop with its prickly fruit is very common in gardens though not mentioned by Drs. Roxburgh or Wight. The three species may be briefly characterized as follows.—(as given by Prof. Oliver in his Flora of Tropical Africa.)

*—*petals* 3, *inner or very minute.*

Leaves narrow, oval-oblong, acuminate acute or scarcely obtuse, often a little rough and the nerves minutely pubescent or glabrescent below, flowers 2-4 together, fruit cordate or ovoid or ovoid-obtuse, faintly marked with nearly plane areolæ ... ... 1. A reticulata (the bullock's heart.)

Leaves slightly acuminate, obtuse or acute, glabrous or glabrescent more or less glaucous beneath, flowers solitary or in pairs, fruit ovoid-globose or rather conical, with prominent convex rhomboidal areolæ. ... 2. A squamosa (the custard apple.)

—*petals* 6, *inner conspicuous.*

Leaves obovate-oblong or oblong shortly acuminate, soon glabrous, inner petals broadly ovate-rotundate fruit ovoid or oblong-cordate, areolæ with short ascending aculei. ... ... 3. A. muricata (the sour sop)

XYLOPIA. L.

Flowers hermathrodite, sepals 3 more or less connate, sepals 6 valvate in 2 series, exterior 3 linear, linear-subulate oblong or rarely-ovate thick usually scarcely expanding or connivent, 3 interior more or less shorter, similar in form and triquetrous above or ovate lanceolate and keeled and acute, torus plane or convex, plane or concave in the centre and in the latter case including the ovaries, stamens indefinite, the innermost sometimes coherent by their filaments into a sheath surrounding the ovaries or inserted upon a sheathing deciduous annular extension of the torus, usually narrow linear, anther cells frequently multilocellate, connective truncate dilated or more or less subpeltate, carpels few or numerous, styles elongate exserted forming a connivent cone ; ovules 2-10.—(Cælocline, *Alp. Do.* ;—Patonia, *Wight* ;—Habzelia, *H. f. et T.*)

This genus has not been found on the Continent.

(1) X. parviflora, H. f. et T. and (2) X. Championi, H. f. et T. are small trees, and (3) X. nigricans, H. f. et T., a shrub indigenous in Ceylon.

CYATHOCALYX. CHAMP.

Flowers hermathrodite, sepals 3 joined into a 3-toothed or subentire cup, petals 6 valvate in 2 series concave at the base and constricted round the stamens, plane above, coriaceous, torus depresso-conical concave, stamens indefinite narrow cuneate, truncate at the apex, ovary 1 partly hid in the concave torus, oblong, stigma large peltate, ovules indefinite in 2 series on the ventral suture. A tree, leaves glabrous shining.

1. CYATHOCALYX ZEYLANICUS. (Champion). A middling sized tree, leaves oblongo-lanceolate with a sudden point, 6-10 inches long by 2-3 broad, shining and glabrous on both sides, peduncles 1-3 about ½ an inch long, calyx cup hoary, petals 1-2 inches long more or less hoary, fruit broadly oval, a little larger than a goose's egg, seeds in 2 series numerous compressed 1 inch long transversely rugose, testa reddish brown.—*Champ. MS.* ;—*Hook. f. and T. Fl. Ind.* 1. *p.* 127 ;—*Bedd. Ic. Pl. p.* 10. *t.* xlvii.

This tree, which was formerly only known as a Ceylon and Malay plant, I have discovered throughout the moist forests of Malabar, South Canara and the Anamallays, at an elevation of 1-3,000 feet.

UNONA. LINN. F.

Flowers hermathrodite, sepals free valvate or very slightly imbricate at the base, petals 6 valvate in 2 series, plane spreading or the base more or less connivent round the genitalia nearly equal or the inner shorter or rarely wanting, stamens indefinite oblong-quadrate or cuneate, connective thickened and globose or truncate and dilated above the anther cells, torus plane or convex, ovaries indefinite free, stigma ovate obovate oblong linear or clavate sulcate on the inner face, ovules 2 many, 1 seriate or sub 2 seriate, carpels usually stipitate constricted between the seeds or continuous ovoid. Trees or shrubs.

1. UNONA PANNOSA. (Dalz.) A middling sized or small tree, leaves ovato-lanceolate obtusely acuminate 2½-4 inches long, ¾-1½ broad, glabrous above, flowers of a dirty white color, axillary subsessile, sepals villous on the outside ovate acute 3 lines long, petals oblongo-lanceolate villous (like wooly cloth), 1-2 inch long, connective capitate subtruncate, ovaries 8-12 densely strigose, crowned with a short style, stigmas capitate, ovules 2 3, carpels 5-6 oval obtuse shortly pedicellate ⅝ths of an inch long, seeds 1-3 large, testa shining smooth. *Dalz. in Hook. Kew Misc.* iii. 27. Uvaria mollis, *Wall. Cat.* 6475 ;—*Bedd. Icones Pl. p.* 11. *t.* lii.

A tree yielding a valuable strong fibre, common in most of our Western Ghat forests in moist woods up to 3 500 feet ; the wood is very tough.

2. UNONA DISCOLOR. (Vahl.) Is a very small tree or shrub found in Orissa, the Carnatic, Concan, Ceylon, Birmah and Sikkim. 3. U. *elegans* (Thw.) a small tree in Ceylon.

4. U. LAWII (H. f. et T.) a shrub in Malabar, and 5. U. *Zeylanica* (H. f. et T.) a shrub in Ceylon (all of which are figured in the Icones Pl. Indiæ), 6. U. *præcox* (H. f. et T.), and 7. U. *longiflora* (Roxb.) are shrubs found in Northern India.

POLYALTHIA. BL.

For Gen. Char. see letter press to the plate of P. cerasoides, Pl. 1.

1. POLYATHIA CERASOIDES (Dun.), 2. *longifolia* (Wall.), 3. *coffeoides* (Thw.), and 4. *fragrans* (Dalz.), will all be figured in this work as trees of size and importance.

5. P. ACUMINATA (Thw.) is a tree only found in Ceylon, and 6. P. *Moonii* is a shrub only recorded from that island. 7 P. *suberosa* (Dun.), 8. *corinta* (Dun.), and 9. *persicæfolia* (H. f. et T.), are shrubs inhabiting South India and Ceylon.

10. P. JENKINSII and 11. *Simiarum*, are trees found in North India.

PHŒANTHUS, H. F ET T.

Flowers hermathrodite, sepals 3 triangular small, petals 6 ; 3 exterior much smaller than the interior, 3 interior thick coriaceous valvate, stamina linear, connective truncato-capitate, anthers linear oblong, ovaries linear oblong 8-12 or more, ovules solitary or twin on the ventral suture, style oblong.

Only one species of this genus is known on the Continent, Phœanthus Malabaricus (Bedd.) ; it is found in the moist forests on the ghats in Malabar, and is particularly abundant on the Tambercherry ghat. It is a large shrub.

SACCOPETALUM, BENNET.

For Gen. Char. see letter-press to plate of S. tomentosum, Pl. xxxix.

1. S TOMENTOSUM ; for description see plate.

2. S. LONGIFLORUM (H. f. et T.) A large tree, leaves oval-oblong or oblongo-lanceolate, shining above, beneath adpresently puberulous, 8 inches long, by 3 broad (petioles ½ inch) slightly coriaceous, flowers axillary from the axils of the fallen leaves, sepals oblong 2 lines long, interior petals oblongo lanceolate obtuse ⅓ inch long puberulous torus densely albo-villous, style elongate filiform subclavate at the apex, ovaries numerous, ovules about 10.—(*Wall. Cat.* 6443. *H. f. et T. Fl. Ind.* 1, *page* 151.)

A tree (nearly allied to the species figured) found in the Terai at the base of the Himalayas and in Upper Bengal.

MILIUSA. LESCH.

For Gen. Char. see letter-press to plate of M. velutina, Pl. xxxvii.

1. MILIUSA VELUTINA, for description see plate.

2. MILIUSA WIGHTIANA (H. f. et T.) A small tree, leaves narrow-oblong lanceolate to linear oblong with a longish obtuse acumination glabrous on both sides 1½ to 4 inches long ¾ to 1 inch broad, petioles 1 2 lines long ; peduncles slender, 1-1½ inch long (and elongating in fruit) furnished with about 3 bracts at the base and 1 below the middle, sepals and exterior petals very small equal ciliate, interior petals about ½ an inch long glabrous or subglabrous, stamens about 22 in 3 series, ovaries glabrous about 20, style oblong, nearly as long as the ovary, ovules 1-2 on the ventral suture, fruit bearing peduncles 2 inch long, pedicles ¼ to ½ an inch, carpels glabrous globose 1 seeded, or oblong 2 seeded. *H. f. et T. Fl. Ind.* 1, *p.* 149 ;—*Bedd. Icones Pl. p.* 18. *t.* lxxxvi.

A small tree common in moist forests on the South Tinnevelly and Travancore mountains from 3,000 up to nearly 5,000 feet elevation.

3. MILIUSA ZEYLANICA (Gardn.) is a small tree in Ceylon, 4. *M. montana* (Gardn.) 5. *Indica* (Lesch), and 6. *Nilagirica* (Bedd.) are found in the western coast forests of the Madras Presidency, but do not grow to more than large shrubs ; these are all figured in the Icones Pl. Indiæ Or. 7. *M. Wallichiana* (H. f. et T.), 8. *Roxburghiana* (H. f. et T.), and 9. macrocarpa (H. f. et T.), are all three small trees natives of Northern India.

ALPHONSEÆ.

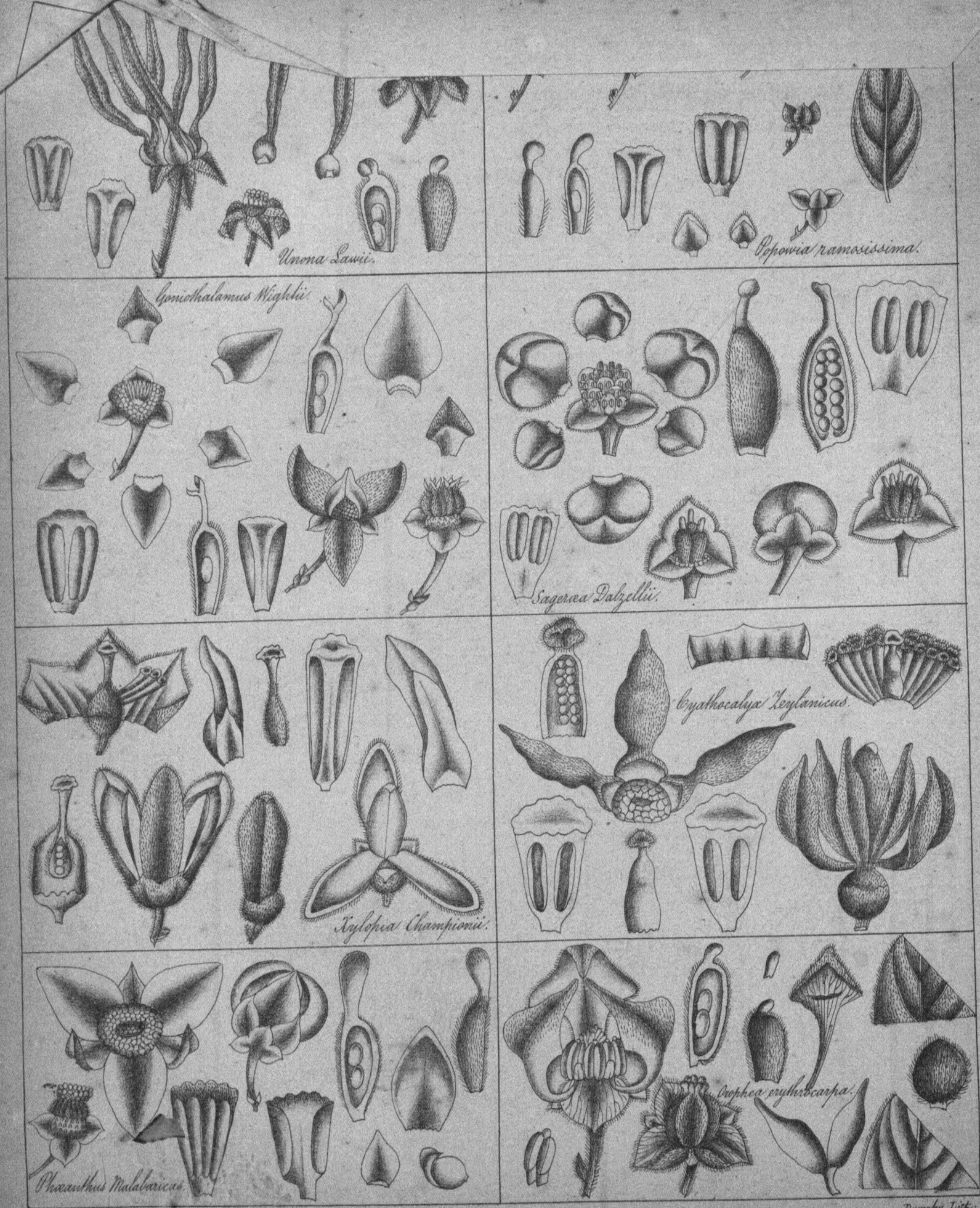
For Gen. Char. see letter-press to plate of A. Madrasapatana.

1. ALPHONSEA MADRASAPATANA for description, see plate.

2. ALPHONSEA LUTEA. (H. f. et T.) A large tree, leaves oval oblong rounded or attenuated at the base, coriaceous, glabrous on both sides, and very shining above, 3 4 inches long 1½-2½ broad, petioles 2-3 lines long, flowers congested small, fascicles leaf-opposed, sepals rounded deciduous, petals externally pilose scarcely ⅓ an inch long, 3 exterior a little larger and pilose within on the upper portion, the interior glabrous on the inside, stamens indefinite in 3 rows, ovaries 5 strigoso-pilose, style very short, torus dilated in fruit globose, carpels 4-6 broadly oval 1½ inches long fulvo-puberulous 3-6 seeded. *H. f. et T. Fl. Ind. p.* 153. Uvaria lutea, *Roxb. Fl. Ind.* ii. 66 (not W. A.);—*Bedd. Icones Pl.* 19 *t.* xci.

A handsome tree, banks of streams on the Orissa mountains and in Ceylon, Sylhet and Ava, and (if I do not mistake the species,) also on the ghats in South Canara.

3. ALPHONSEA ZEYLANICA. (H. f. et T.) A tree, leaves coriaceous, glabrous and shining above, lanceolate to elliptico-lanceolate, 2½-4 inches long, ⅔-1¼ broad, petioles slender ¼ inch long, peduncles leaf opposed or supra-axillary, scarcely ¼ inch long, pedicels 1-3 about ½ an inch long, petals ⅔ inch long puberulous, stamens about 30 in 3 series, ovaries 5-6, style depressed, torus in fruit large glo-



Govindoo del.

Dumphy, Lith.

bose, carpels subglobose fulvo-tomentose, irregularly tuberculate 1¼ inch in diameter, seeds 4-6 in a single series. *H. f. et T. Fl. Ind.* 153. Uvaria lutea, *W. A. Prod.* 8. (Excl. Syn.) Guatteria acutifolia, *Wall. Cat.* 6,438 *D.;—Bedd. Icones Pl. p.* 19. *t.* xc.

A tree not uncommon on the Tinnevelly and Travancore mountains and in Ceylon (2-3,000 feet elevation.)

4. ALPHONSEA VENTRICOSA (H. f. et T.) is a large tree in North India.

OROPHEA. BLUME.

Sepals 3, petals 6 valvate, exterior 3 oval, interior 3 usually delicate in texture unguiculate, cohering above into a cap, stamens definite 6-12 loosely inserted on to the scarcely convex torus, some occasionally sterile, ovaries 3-15 oblong or obovate, ovules 2-4 in a single series on the ventral suture, stigma sessile capitate or oblong. Trees or shrubs, leaves small.

1. OROPHEA ERYTHROCARPA. (Bedd.) A tree, bark olive green smooth, young parts aureo-pubescent leaves elliptic acuminate 2½ 5 inches long, 1-2 broad glabrescent above, subpubescent beneath, petioles 1-2 lines long, peduncles axillary or above the axils bearing 3-5 pedicels, flowers ½ an inch in diameter, stamens 12 in 2 series, outer row sterile and very small, ovaries 6, 2 ovuled, carpels oblong acute 1 inch long, bright red, seed 1 scrobiculate. *Bedd. Lin. Trans. Vol. XXV* and *Icones Pl. Ind. Or. p.* 14. *t.* lxviii.

I have only found this elegant small tree in the moist forests of the Anamallays, at an elevation of about 2,000 feet; its wood, is very tough.

2. OROPHEA THOMSONI. (Bedd.) A small tree or large shrub, glabrous, except the inflorescence and the costa of the leave beneath, leaves ovato-elliptic 2-4 inches long, 1½ broad, petioles 1-2 lines long, pedicels very short axillary 3 flowered, pedicels very short, sepals and petals strigose on the outside, stamens 10-12 biseriate, ovaries strigose 5-6 biovulate, carpels round size of a pea *Bedd. Lin. Tra. Vol. XXV.* and *Icones Pl. p.* 14 *t.* lxvii.

A small tree or large shrub common in moist forests on the western side of the Madras Presidency at 1—4,000 feet.

3. OROPHEA UNIFLORA (H. f. et T.) Is a shrub common in our western forests up to nearly 4,000 feet. 4. *O. Zeylanica* (H. f. et T) is a shrub or very small tree found on the North Canara ghats and in Ceylon. 5. *O. coriacea.* (Thw.) : and 6. *O. Obliqua* (H. f. et T.) are both small trees found in Ceylon. These are all figured in the Icones Pl. Ind. Or.

ANALYSIS OF GENERA.

PL. I. ANONACEÆ.

This plate gives the analysis of the following trees or shrubs, as no trees of these genera will be figured in the plates.

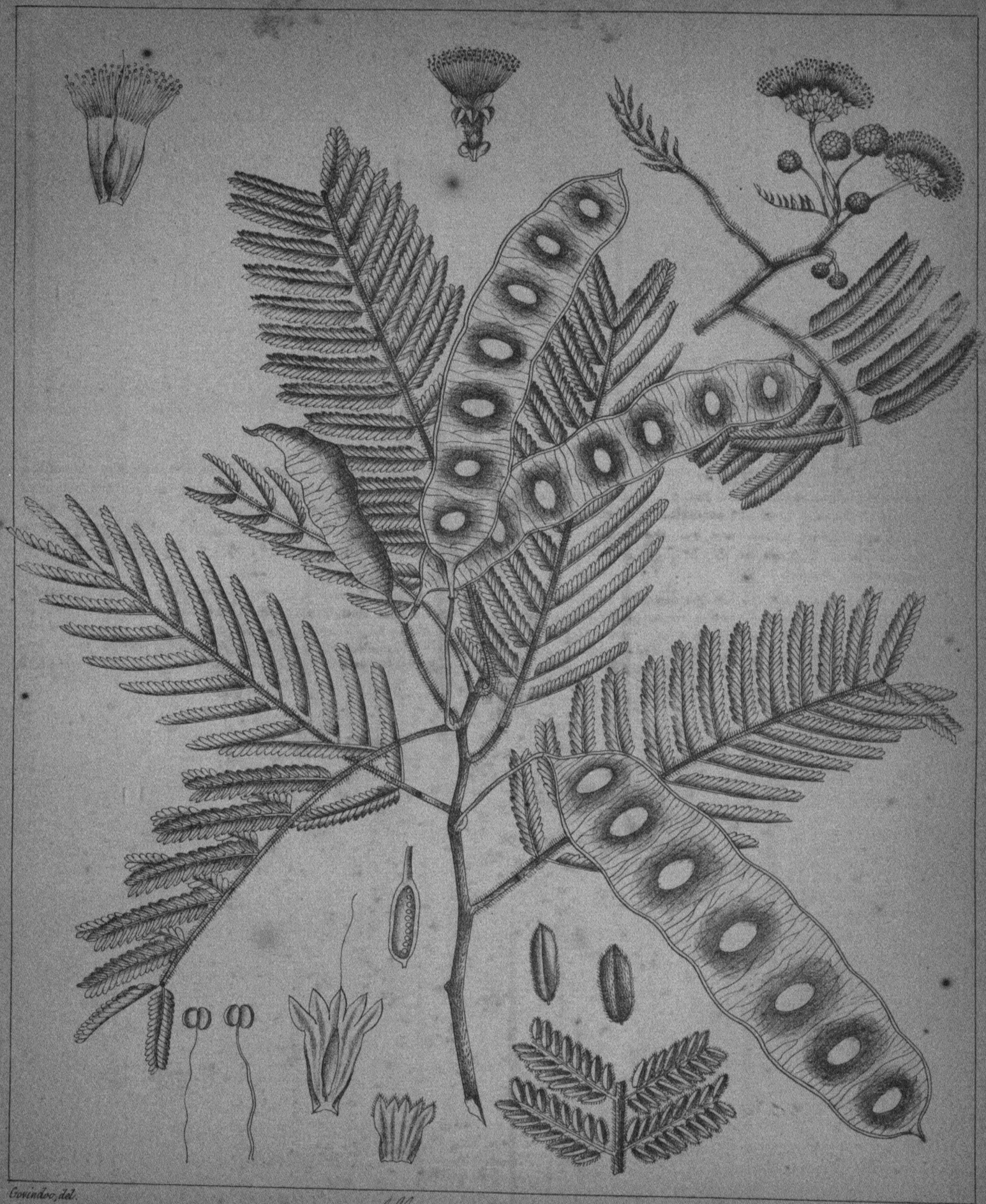
Unona Lawii	Sagerea Dalzellii	Phœanthus Malabaricus.
Popowia ramosissima.	Xylopia Championii	Orophea erythrocarpa.
Goniothalamusaly.	Cyathocalyx Zeylanicus.	

ALBIZZIA AMARA. (Nat. order Leguminosæ; Sub-order Mimoseæ.)

For Gen. Char. see under "A. Lebbek."

ALBIZZIA AMARA. (Willd.) A tree, unarmed; branches terete, young shoots petioles peduncles and under side of the leaflets clothed with yellowish tomentum; leaves bipinnate, pinnæ 8-10 pair with a gland on the petiole and between the last pair, leaflets 20-30 pair, when old somewhat glabrous, stipules lanceolate, peduncles solitary or aggregated long and filiform in the axils of the upper leaves and racemose from the abortion of the leaves; flowers small in globular heads, corol 5 cleft, stamens long numerous monodelphous; legumes flat thin broadly linear 3-6 seeded. Acacia amara, *Willd. Sp.* 4, *p.* 1074;—*W. A. Prod. p.* 274. Mimosa amara, *Roxb. Fl. Ind.* ii, 548.

A tolerably large tree but of low stature, very abundant throughout the Madras Presidency, Mysore and Bombay, and also inhabits the north of Ceylon. It is called Nalla renga or Nalla regoo and Narlingee in Teligu, and Woonja in Tamil; it has a maximum height of about 30 feet, with a girth seldom exceeding 5 or 6 feet. The wood is dark-brown, mottled, and very handsome, strong, fibrous, and stiff, close-grained, hard and durable, superior to Sâl and Teak in transverse strength and direct cohesive power, it is much used by the natives for building purposes, beams, &c., and in the construction of carts and ploughs, and makes excellent fuel, being most extensively cut for the Locomotives in the Salem district and along the Bangalore line; the natives use the leaves for washing their hair; the tree grows most rapidly as coppice



Govindoo, del.

Albizzia amara (Willd.)

Dampky, lith.

MICHELIA NILAGIRICA. (Nat. order Magnoliaceæ.)

MICHELIA. *Linn. Gen. Pl.* 1. 19.—GEN. CHAR. Flowers hermathrodite, sepals and petals all similar and colored, 9-many, in 3-many series imbricate, anthers linear adnate introrse bursting longitudinally, gynophore stipitate, ovaries many, spicate one celled 2-8-many ovuled, carpels arranged in a loose spike of a consistence between leathery and fleshy opening from the apex downwards, seeds several externally fleshy. Trees, with entire leaves like the Magnolia, flowers large axillary fragrant white or yellow.

MICHELIA NILAGIRICA. (Zenker.) A handsome tree of considerable size with the young parts sericeo-villous, leaves elliptic acute, or oval obtusely acuminate or broadly obovate, glabrous on both sides or pubescent on the costa beneath, very variable in size 3-5 in. long, by 1½-2 broad, petioles ⅔rd in. long, flowers white, sepals and petals 9-12 exterior obovate, interior oblongo-lanceolate acute, spathes silky, stamens numerous shorter than the column of fructification, ovaries numerous, ovules 2-4, carpels warty arranged along a spike 2-3 inches in length. *Zenker Pl. Ind. t.* 20;—*Wight Ill.* i, 14; *Icon. t.* 938. M. Pulneyensis. *Wight Ill.* i. 14, *t.* 5. M. ovalifolia glauca et Walkeri, *Wight l. c.* 13.

This is a very ornamental Magnolia-like tree common on the higher ranges of the Nilgiris, Pulneys, &c., and on the elevated mountains in Ceylon, and occasionllay met with at lower elevations in our western forests. It differs considerably in the size and shape of the leaves, and size of its perianth-leaves, and Dr. Wight made several species of the S. Indin and Ceylon forms, but they all run one into another and cannot be properly distinguished, at least more than varieties. It is called Shemboogha in Tamil; the wood is strong, close and fine grained, but very hygrometrical; it is used for building purposes, beams and rafters.

Cowinder del. Dumphy, Lith.

Michelia Nilagirica (Zenker)

BENGAL SECRETARIAT
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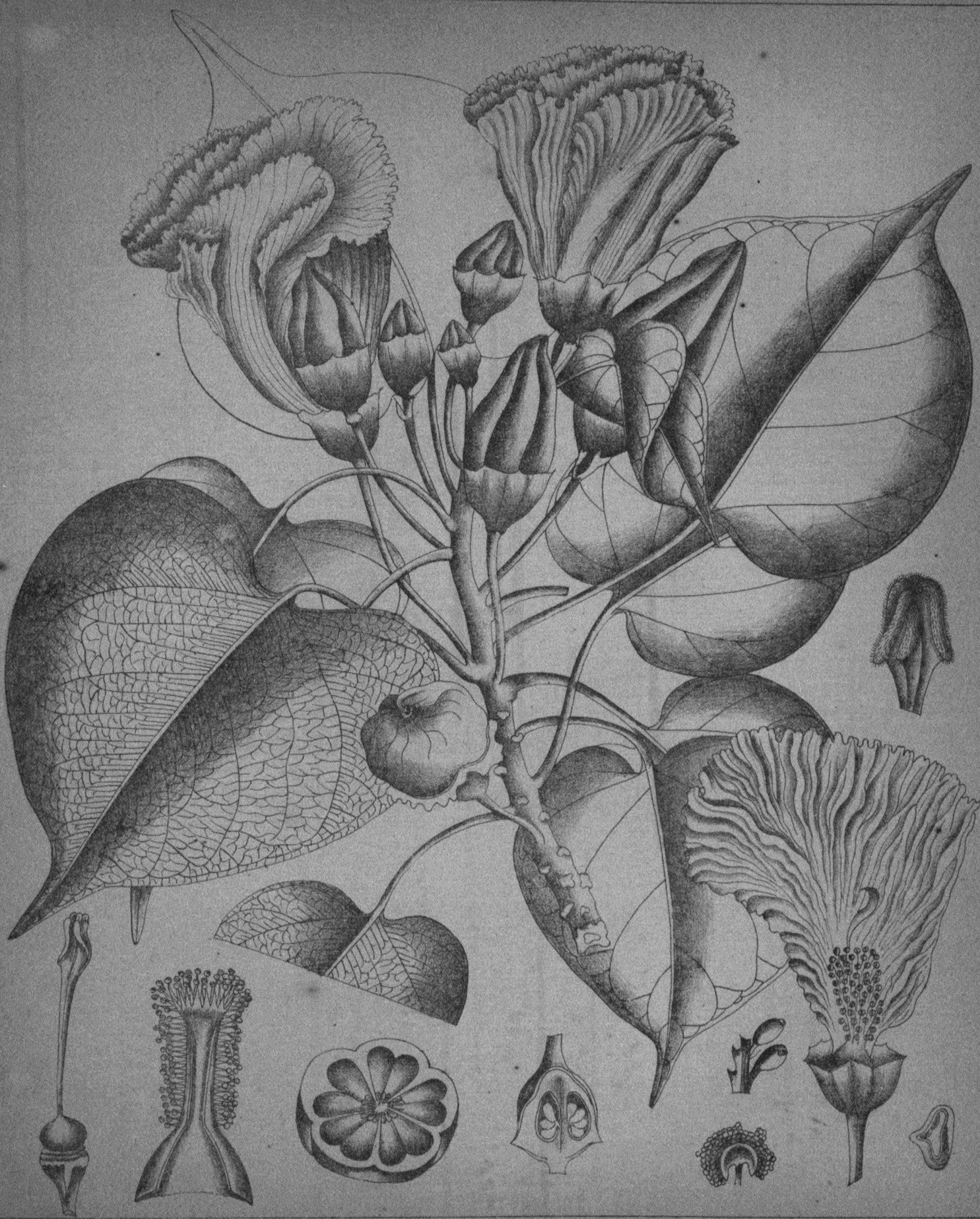
THESPESIA POPULNEA. (Nat. order Malvaceæ.)

THESPESIA. *Corr. Gen. Pl.* 1. 208.—GEN. CHAR. Bractlets 3-8 small or deciduous, calyx minutely 5 dentate, rarely 5 cleft, column toothed at the apex; ovary 5-celled, each cell with a few ovules, styles club-shaped with 5 grooves, capsule woody coriaceous opening loculicidally or almost indehiscent, seeds obovoid glabrous or tomentose, cotyledons much folded enclosing the radicle often marked with small black dots. Trees or shrubs, leaves entire or lobed, flowers yellow, this genus is distinguished from Hibiscus by its confluent stigmas, more woody capsule and obovoid compressed seeds.

THESPESIA POPULNEA. (Cav.) A tree, young branches as well as the petioles, pedicels and calyx covered with small peltate scales, leaves long petioled cordate ovate acuminate, 7 nerved, smooth leathery entire or sinuous, stipules falcate, flowers solitary, axillary stalked, peduncles shorter than the petiole, epicalyx of 5 oblongo-lanceolate deciduous segments as long as or longer than the cup-shaped entire or slightly 5 lobed calyx, corol nearly 2 inches in length 4 times exceeding the calyx, fruit roundish depressed slightly beaked 5 celled indehiscent or opening to a slight extent at the top, seeds 2 in each cell of the fruit large compressed laterally near the hilum, roundish above, testa pubescent nervoso-striate. *Dc.* 1, 456. Hibiscus populneus, *Linn. Sp.* 976.

A handsome tree when in flower and of very rapid growth; it rarely exceeds 15 *or* 20 *feet in height, or a circumference of* 6 *feet; it is abundant throughout India and in Ceylon as an avenue or cultivated tree, particular near the coast, but I have never seen it in forests; it is very generally known by its Hindustani name of Pàras pipal, and is alled Pursa and Poorsung in Tamil, and the Portia tree by Europeans, and in Ceylon its native name is Sooreya. The tree grows very readily from cuttings; any large boughs stuck into the ground rooting readily, but these trees have always the heart wood very unsound, and are only fit for fuel, and besides have a gnarled and ugly appearance; handsome trees are grown from seedlings, and their timber is highly prized, it is strong, straight, even grained and durable, of a pale reddish color fading to reddish brown, and is easily worked. A cubic foot unseasoned weighs* 59 *to* 62 *lbs., and seasoned* 49 *lbs., and the specific gravity is* ·784; *it is much used for gun stocks and also for furniture, boat timbers, naves, felloes, pannels of carriages and cart framing, &c.; the capsules yield a yellow dye which is used as a wash for cutaneous diseases, as is also the bark boiled in water, and the latter is given internally as an alterative.*



Fowndes del. Dunphy, Lith.

Thespesia populnea (Corr.)

MESUA COROMANDELINA. (Nat. order Guttiferæ; Tribe Calophylleæ.)

MESUA. *Linn Gen. Pl.* 1. 176.—GEN CHAR. Flowers hermathrodite, sepals 4, petals 4, stamens numerous free or connate at the very base, filaments filiform, anthers erect oblong 2 celled dehiscing longitudinally, ovary 2 celled, style elongate, stigma peltate, ovules 2 in each cell erect, fruit from fleshy to nearly woody one celled from the obliteration of the dissipiment, 2 valved 1-4 seeded, seed exarillate, cotylodons thick fleshy, radicle very small. Trees, leaves simple oblong lanceolate very shining above, glaucous beneath, flowers large white axillary or terminal solitary.

MESUA COROMANDELINA. (Wight.) Leaves narrow lanceolate ending in a long tapering blunt point, shining above pale or more or less glaucous beneath, 2½-3½ inches long by 1-1⅛ broad, petioles ⅜ of an inch long, flowers axillary and terminal about 1½ inch across when fully expanded, peduncles shorter than the petioles. *Wight Icones Pl.* 117. Mesua ferrea, *W. A. Prod. p.* 102 (*Excl. syn.*) Mesua pulchella, *Planch. et Triaw*, a Ceylon tree, is very closely allied.

This is a very handsome tree common in most of the mountain forests on the western side of our Presidency, growing with its congener M. speciosa, from which it is readily known by its much smaller leaves and flowers; it is generally known by the name of Nàghà or Nàghà Champa, and is called Nangal and Mallay Nàngal in Tamil, and on the Tinnevelly ghats, where it is very abundant and its timber much in use; it is called Nir Nang to distinguish it from Mesua speciosa which is called Nàng. All the Mesuas have a very hard heavy reddish colored timber known as Iron wood and perhaps the hardest and heaviest timber in India, axemen dislike very much to fell them, as they turn the edge of their axes, the wood is most valuable for engineering purposes and is largely used in Ceylon, and this species is much in use with the natives in Tinnevelly, and is looked upon as one of their best timbers, but in the Wynad and other parts, where it is also abundant, it is not utilized and seems hardly to be known.

ndoe, del.

Mesua Coromandelina (Wight.)

Dumphy, Lith.

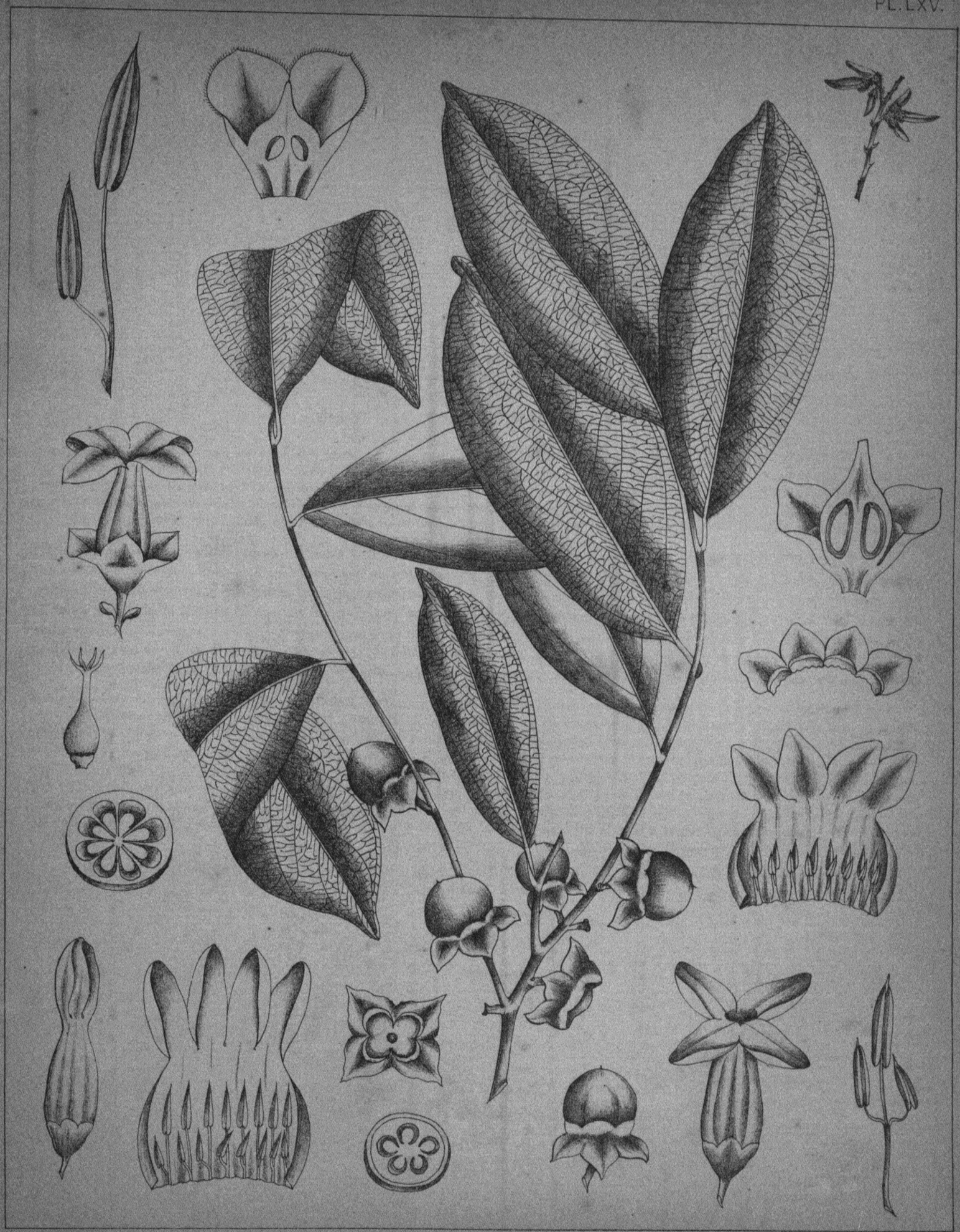
DIOSPYROS EBENUM. (Nat. order Ebenaceæ.)

DIOSPYROS. *Dalech, Dc. Prod.* viii, *p.* 222.—GEN. CHAR. Flowers diœcious, calyx 4-6 lobed or very rarely splitting irregularly, corol tubular campanulate or hypocrateriform æstivation convolute 4-6 lobed, stamens in the male flowers 8-50 generally about 16 inserted at the base of the corol or on the disk or partly on both, filaments of equal length or very unequal and each bearing 1-7 anthers, anthers linear lanceolate, ovary abortive, stamens in the female flowers 0-4-8 or more sterile, ovary 4-8 or rarely 12 celled usually covered at the base with the somewhat enlarged calyx. Trees or large shrubs armed or unarmed, leaves alternate rarely subopposite, flowers axillary, the female solitary, the male usually in little clusters.

DIOSPYROS EBENUM. (Retz.) A large tree, leaves glabrous shining membranaceous or slightly coriaceous, oblong obtuse or shortly and bluntly acuminated, 2-7 inches long by ¾ to 2½ broad, petioles 2-4 lines long, male peduncles short pilose bracteated about 3 flowered, calyx funnel-shaped slightly pilose, 4 cleft at the apex, corol long hypocrateriform shortly 4 cleft at the apex, stamens 8-10 inserted on to the base of the corol, generally 2 cleft, each division bearing an anther, one of which is much longer than the other, sometimes 3-4 cleft with as many anthers, no rudiment of an ovary, female flowers solitary, calyx 2 bracteated much larger than in the male, deeply 4 cleft with a callous elevated, 4 lobed marginal ring round its mouth, stamens 8 with double anthers (sterile) inserted on to the base of the corol, stigmas 4, ovary 8 celled, albumen not ruminate. *Dc. Prod.* viii, *p.* 234 ;—*Wight's Icones, t.* 188.

This valuable tree is not uncommon in our mountain forests on both sides of the Presidency and in Ceylon ; it yields the best kind of Ebony, generally jet-black but sometimes slightly streaked with yellow or brown, it is very heavy, close and even grained, and stands a high polish. unseasoned it weighs 90 *to* 100 *lbs. the cubic foot and* 81 *lbs. when seasoned, and has a specific gravity of* 1·296 ; *it is used for inlaying and ornamental turnery and sometimes for furniture, but there is not much demand for it in this Presidency. The sap wood is white, hard, close-grained and strong but not durable, but is used by the natives for various purposes ; it is called Nalluti in the Cuddapah and Kurnool hill forests, where the tree is very common and well known. The tree figured by me in my Annual Report for* 1866-67 *as Diospyros assimilis is very nearly allied if distinct as a species, it differs however in each of the stamens in the male bearing* 4-6 *anthers instead of generally only* 2 *and the stamens in the female flower being single instead of double, its leaves turn very black in drying ; it is called Karâ mârâ in the South Canara forests, where it is very common both in the heavy forests in the plains and on the ghats.*

The plate represents a fruiting branch of the female tree, a flowering twig of the male, and dissections of the flowers of both sexes.



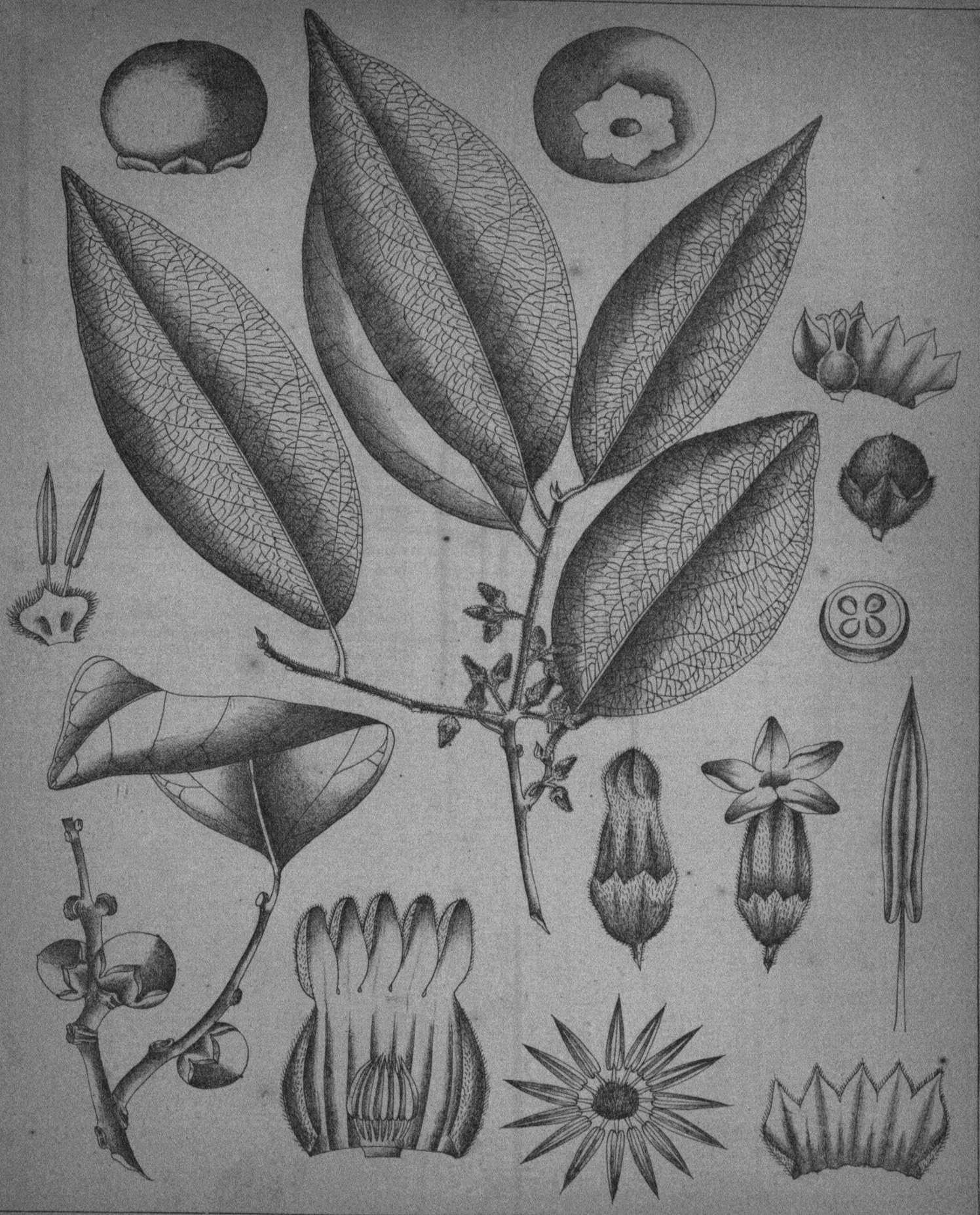
DIOSPYROS EXSCULPTA. (Nat. order Ebenaceæ.)

For Gen. Char. see under "Diospyros Ebenum."

DIOSPYROS EXSCULPTA. (Ham.) A good sized tree, all the young parts covered with rusty down, leaves alternate and opposite, oval to elliptic attenuated at both ends softly downy, 3-5 inches long by 1½-2 broad, petioles ¼ to ½ inch long, male peduncles a little shorter than or the length of the petioles, 3 flowered, calyx campanulate, 4-6 lobed at the apex, lobes acute erect, corol gibbous 4-6 parted, divisions of the corol very downy rounded at the apex, stamens 10-15 seated on the hairy receptacle, no rudiment of an ovary, female flowers solitary short pedicelled, calyx deeply 4-6 parted with the lobes reflexed at the margin outwards, corol 4-6 parted, divisions rounded at the apex, stamens none, ovary round hairy 4 5 celled, styles 2 each 2 cleft, fruit size of a pigeon's egg edible. *Dc. Prod.* viii, *p.* 223. Diospyros tomentosa, *Roxb. F. Ind.* ii, *p.* 532.

This valuable tree is not uncommon in the Cuddapah, Salem and Kurnool forests, and probably elsewhere in our Presidency, and is found in Bengal and Bombay, it grows to a considerable size and yields a valuable jet-black ebony very similar to that of ebenum, in fact I doubt if the 2 woods could be easily distinguished; it is called Tunki in the Cuddapah district and Tumboornee in the Bombay Presidency. The tree sheds all its leaves in the cold season, and they appear again with the flowers in the beginning of the hot weather.

The plate gives a branch of the male tree in flower and a branch of the female in fruit, and dissections of both male and female flowers.



Govindoo del.

Diospyros exsculpta (Ham.)

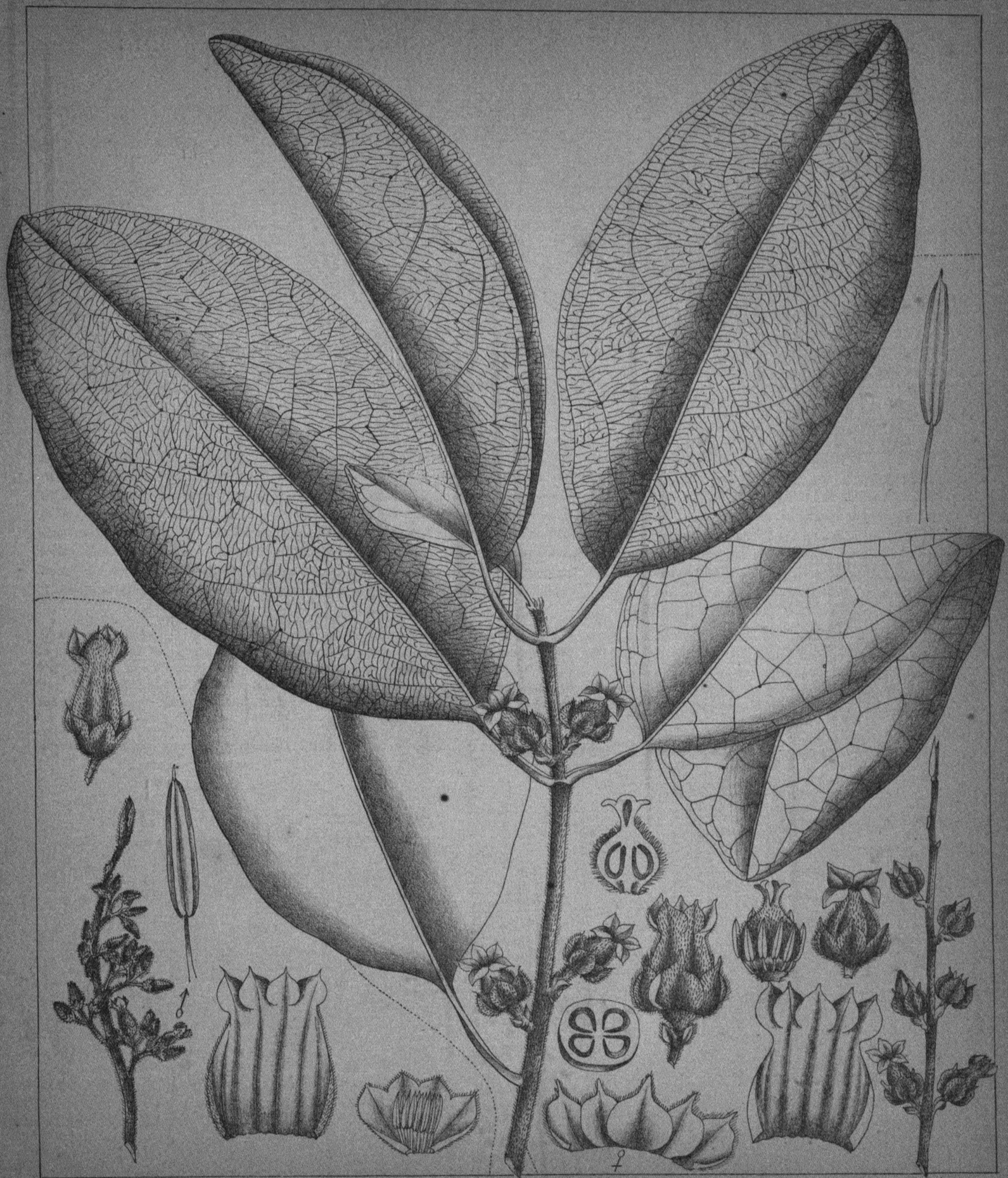
DIOSPYROS WIGHTIANA. (Nat. order Ebenaceæ.)

For Gen. Char. see under " D. Ebenum."

DIOSPYROS WIGHTIANA. (Wall.) Arboreous, young parts and inflorescence densely velvetty with golden or rust colored down, leaves alternate and opposite oblong or oval acute or obtuse or sometimes cordate at the base densely velvetty beneath, less so or glabrescent above 3-7 inches long by 1½ to 3 broad, petioles ¼ to 1 inch long velvetty, male flowers on small cymose peduncles which are the length of or longer than the petioles and densely velvetty bearing 6-9 flowers on 2-3 pedicels, calyx tubular slightly 4–5, cleft at the apex, teeth sharp erect, corol tubular 4-5 lobed at the very apex, lobes acute, stamens about 13 seated on the disk, no rudiment of an ovary, female flowers solitary on thick peduncles which are bracteated at the apex and much shorter than the petioles, calyx deeply 4-5 lobed with the lobes acute and reflexed at the margin outwards, corol about twice as long as the calyx, tubular 4-5 lobed at the apex glabrous within and outside at the base, lobes acute, stamens 8-10 sterile seated on the disk, ovary 4 celled, styles 2 each 2 cleft, fruit large edible. *DC. Vol.* viii, *p.* 223.

This tree is common in most of our dry forests, and until I examined it critically I always considered it the D. melanoxylon, which species I have not met with if distinct from this, but this has always a 4 celled ovary, and quite answers to the description of D. Wightiana as given in De Candolle's Prodromus; its heart wood yields a jet black ebony like the two former, but the trees are always small and stunted in the trunk, as far as I have observed, and all ebony in log I believe comes from the two former species. It is called Tendu in Hindustani, and Tunki Tumi and Tumbi in Tamil and Telugu; it sheds its leaves in the cold season, and they appear again with the flowers yearly in the hot season.

The plate gives a flowering branch of the female tree, and a flowering twig of the male, and dissections of both male and female flowers.



Govindoo, del.

Dampby, Lith.

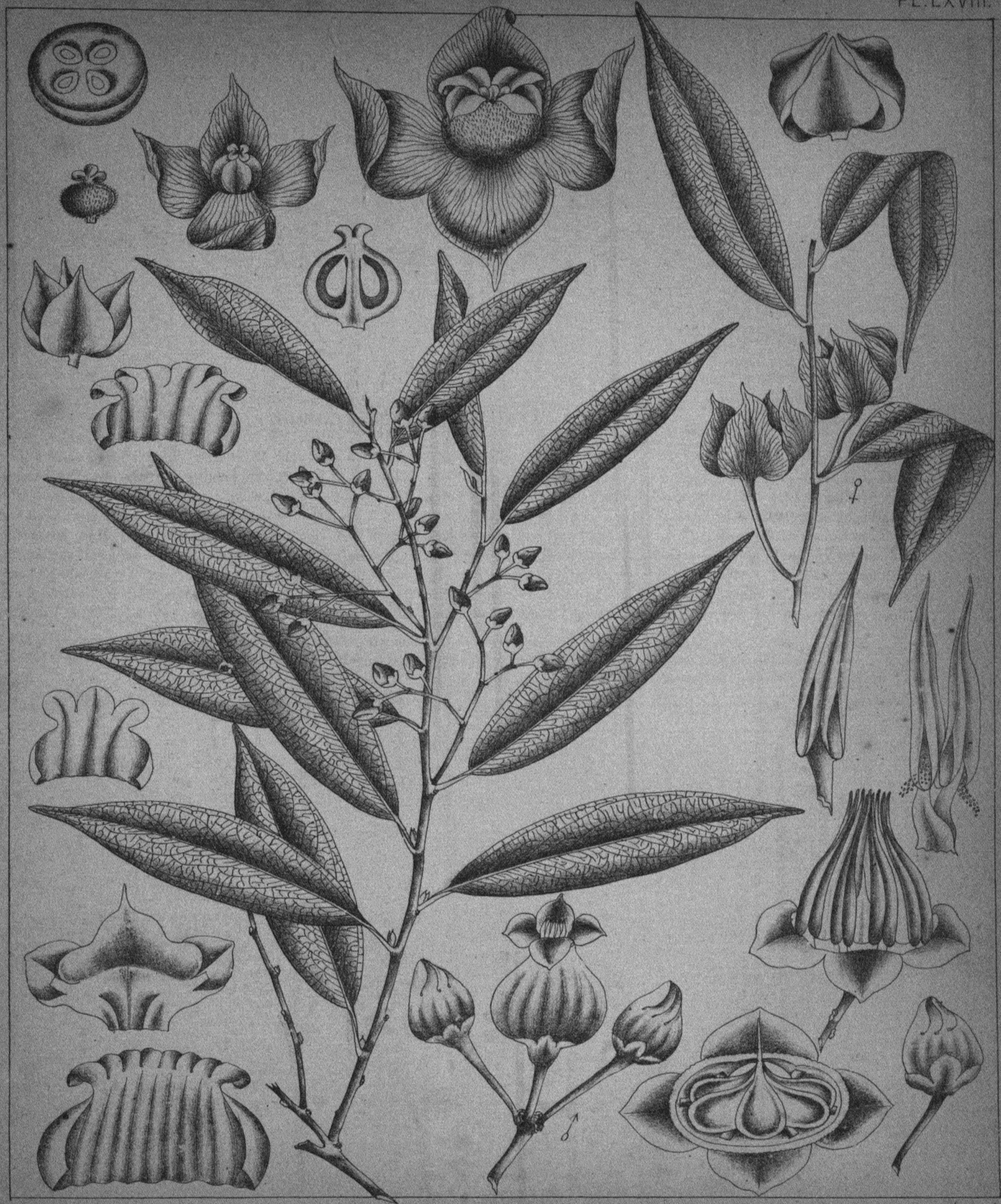
Diospyros Wightiana (Wall.)

DIOSPYROS CALYCINA. (Nat. order Ebenaceæ.)

DIOSPYROS CALYCINA. (Bedd.) A good sized tree, every where glabrous, leaves dark shining green narrow lanceolate attenuated at the base, tapering at the apex into a very blunt point about 3-3½ inches long by a little less than 1 inch broad, petioles about ¼ inch long, male cymes about half the length of the leaves 3-9 flowered, calyx small 4 toothed, corol urceolate very gibbous at the base 4 lobed at the apex, bright yellow in color, stamens 6 or 8 each with 2 anthers of equal length placed on the disk surrounding the large rudimentary ovary, apex of the anthers inflexed and meeting over the sterile ovary which latter is 5 lobed and terminates in a long acumination, filaments slightly hairy ; female flowers solitary on long peduncles nearly half the length of the leaves, calyx of 4 rarely only 3, large cordate imbricate nerved segments which enlarge with the fruit, corol urceolate gibbous tube nearly globose, 4 rarely only 3 cleft at the apex, divisions reflexed, staminodia none, ovary 4-celled, stigmas 4 or 3 sessile, fruit globose, covered with hairlike scales. *Bedd. Annual Report of the Conservator of Forests, Madras Presidency, for* 1867-68, *t.* 1 *and* 2.

This very curious species of Diospyros has only been observed in the Tinnevelly district and southern portions of Madura, where, however, it is very abundant in the ghat forests from the foot up to 3000 *feet elevation ; it is called Vellay Toveray, and yields a valuable light colored wood, which is much in use in the Tinnevelly district.*

The plate gives a flowering branch of both male and female trees, and dissections of the flowers of both sexes and young fruit.



Govindoo del.

Dumphy Lith.

Diospyros calycina (Redd.)

BENGAL SECRETARIAT
LIBRARY.

BIGNONIA XYLOCARPA. (Nat. order Bignoniaceæ.)

BIGNONIA. *Linn. DC.* ix., 143.—GEN. CHAR. Calyx 5-toothed at the margin rarely entire or 5-parted or 2-3 lobed, corol 2 lipped or nearly equal 5 cleft, stamens 4 fertile didynamous a 5th sterile, anthers with glabrous cells very often distinct, stigma bilamellate; capsule with the valves scarcely convex or flat, partition flat parallel to the valves; seeds in a single row at each side of the partition, winged on both sides, wing pellucid. Trees or shrubs, leaves almost always opposite but very various.

BIGNONIA XYLOCARPA. (Roxb.) A large tree, trunk straight, bark ash-colored rather spongy and considerably cracked, branches sparse, leaves opposite bi-tripinnate 1-4 feet long, leaflets short petioled from semi-cordate to obliquely-oblong entire acuminate glabrous but hard 2-5 inches long by 1-1½ broad, petioles common and partial channelled and sharply angular scabrous with elevated gray specks, panicles terminal corymbose branches several times dichotomous with a single flower in the forks slightly pubescent, bractes ovate-oblong, flowers large white with a tinge of yellow very fragrant, calyx campanulate unequally 5-toothed colored corol campanulate shortly tubular with 5 rounded much curled lobes, stamens as in the genus with a fifth sterile one, ovary oblong with an annular disk round its base 2-celled with numerous ovules attached to 2 thick equi-distant receptacles on each side of the partition, style the length of the stamens, stigma of 2 oblong lobes, capsule linear variously bent about 2 feet long by 1-1½ inches in diameter, of a very hard woody texture and extremely rough with numerous hard tubercles, 1 celled 2 valved partition contrary subcylindric spongy, seeds numerous winged, cotyledons thin nearly round emarginate, radicle short. *Roxb. Fl. Ind.* iii. 108.

A common tree in almost all the Madras forests and in Mysore, Bengal and Bombay; the leaves are deciduous in the cold weather and appear again with or a little after the flowers in March or April; it is a handsome tree and a rapid grower, and worthy of cultivation for ornamental purposes; it is called Vadencarni in Tamil; wood brownish yellow, rather close-grained, takes a good polish, and is used for cabinet purposes.

The plate represents only a portion of a flowering panicle and a very young fruit.

Sowerby, del. Dumphy, Lith.

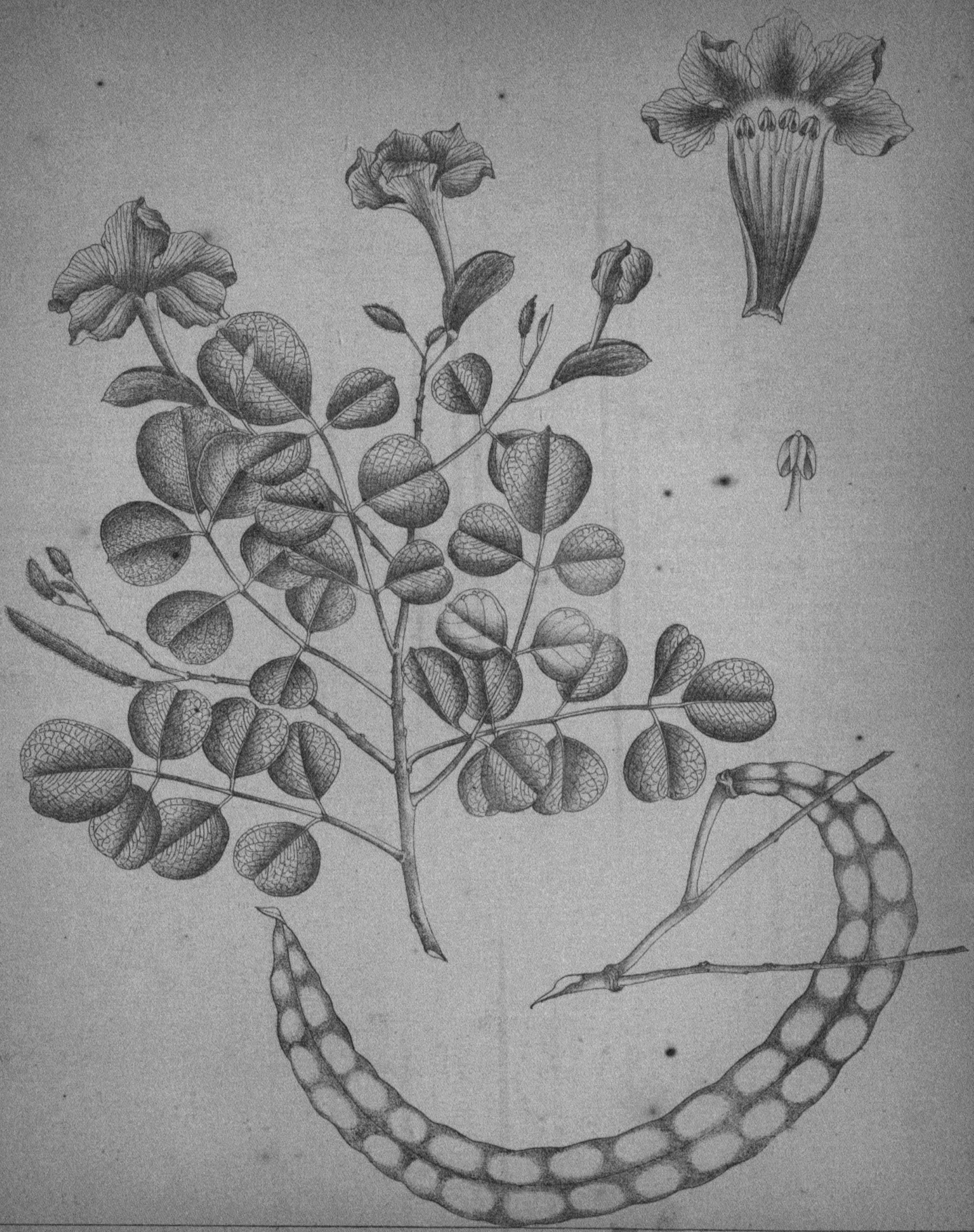
Bignonia xylocarpa (Roxb.)

SPATHODEA FALCATA. (Nat. order Bignoniaceæ.)

SPATHODEA. *Beauv. DC. Prod.* ix, 203.--GEN. CHAR. Calyx spathaceous closed when young at length longitudinally split, then toothed or entire, corol somewhat infundibuliform, limb 5 cleft slightly unequal, stamens 4 didynamous with a fifth sterile, anthers with the cells separate, stigma bilamellate, capsule 2-celled loculicidally dehiscing, partition contrary corky or coriaceous, seeds corky membranaceously winged, attached to the partition not immersed in pits. Trees, leaves opposite rarely alternate, simple, conjugate digitate or unequally pinnate.

SPATHODEA FALCATA. (Wall.) A small tree, trunk very irregular in size and shape, bark light ash-colored, young shoots covered with whitish-down, leaves opposite and alternate unequally pinnate, 3-6 inches long by 1½-2 broad, leaflets opposite 2-3 pairs with a terminal odd one nearly orbicular often very retuse at the apex entire slightly downy short petioled from 1 to 3 inches both ways, racemes about as long as the leaves few flowered, flowers white pretty large, calyx a spathe about ⅔rds open on the convex side, corol tube longer than the calyx, cylindric border about ½ inch across, 5 parted divisions flat equal oblong, stamens as in the genus with a fifth sterile one sometimes present, stigma 2-lobed and capsule linear about 8-12 inches long pendulous twisted in various forms. *Wall. List No.* 6517. Bignonia spathacea, *Roxb. Fl. Ind.* iii, *p.* 103.

A small or middling sized tree common in most of the forests in the Madras Presidency, in Mysore and Bombay, but not found in Ceylon or Burma; it is called Wodi in Teligoo. The timber is light colored, strong and serviceable, and much used by the natives for agricultural purposes, building, &c.



Govindoo, del. Dumphy, Lith.

Spathodea falcata (Wall.)

STEREOSPERMUM CHELONOIDES. (Nat. order Bignoniaceæ.)

STEREOSPERMUM. *Cham. DC. Prod.* ix, 210.—GEN. CHAR. Calyx coriaceous cup-shaped cylindric subtruncate obtusely 5 toothed, corol tube straight companulate limb bilabiate, 5 lobed, stamens 4 fertile, and a fifth small sterile, anthers 2 lobed naked, disk fleshy 5 lobed, ovary cylindric stigma bilamellate, capsule tetragonous or cylindric elongated membranaceous, partition contrary to the valves very cellular and corky thick, seeds bony thinly winged laterally immersed, except the wings, in notches in the partition.

STEREOSPERMUM CHELONOIDES. (Willd.) A large tree, trunk very straight and of great height and thickness, bark thick scabrous brown, branches very numerous, the inferior horizontal, above gradually becoming more and more erect, leaves opposite unequally pinnate about 1 foot long, leaflets opposite with an odd one short petioled generally 4 pair, the inferior smallest obliquely oval ovate or oblong entire pointed sometimes slightly notched about the margin, glabrescent, about 4 inches long by 2 broad, panicles terminal the larger ramifications decussate, the smaller or terminal 2 forked with a sessile flower in the fork, peduncles and pedicels round covered with oblong gray scabrous specks, bracts small caducous, flowers pretty large yellowish very fragrant, calyx 4 (—5?) toothed at the apex, with the two upper teeth bidentate, disk a yellow fleshy ring round the base of the ovary, filaments as in the genus with a fifth sterile one, anthers double, stigma 2 cleft, capsule nearly 2 feet long slender twisted sharply tetragonous, receptacle of the seeds spongy white with alternate notches along the sides in which the seeds lodge. *Roxb. Fl. Ind.* iii. 106;—*Wight Icones, t.* 1341.

This handsome tree is very common in almost all the forests of the Madras Presidency, up to an elevation of about 3000 *feet, and in Mysore, Bombay, Bengal, Birmah and Ceylon, it is generally known by the Tamil name of Pâdri and is called Kâlâ goru and Mokâ Yâpâ in Telugu, Pâdel in Bombay, Loomoo madala in Ceylon, and in Birma Thakooppo. The wood is of a beautiful orange yellow color, close and even grained, elastic and durable, easily worked, and gives a smooth glossy surface; a cubic foot weighs* 57 *to* 60 *lbs. unseasoned, and* 48 *lbs. when seasoned, and its specific gravity is* ·768; *the sapwood is rather coarse-grained, of a brownish white color, and not durable. The wood is much used in housebuilding and for a variety of purposes by the natives; the roots, leaves, and flowers are used medicinally.*

Gwinder, del. Dumphy, Lith.

Stereospermum chelonoides (Willd.)

MENISPERMACEÆ. (By Prof. Oliver.)

Flowers small, diœcious. Sepals usually 6, sometimes 9-12, rarely 4 or 1, nearly always free, usually imbricate, in 2-4 series, the outer smaller, often very minute. Petals 6, shorter than or not exceeding the inner sepals, rarely 4 or fewer, free or united or 0. Male flowers: Stamens equal in number and opposite to the petals, rarely fewer or more, free or united; anthers free, 2-4 celled, dehiscing longitudinally or transversely, or connate in a peltate disk Female flowers: Staminodia 6 or 0 Carpels free, usually 3, in few genera 1 or 6 12, sessile or stipitate; stigma terminal, entire or divided. Ovules solitary, usually amphitropous. Fruit-carpels drupaceous, with the scar of the style subterminal or by eccentric growth brought near to the base. Seed concave or sulcate on the inner face, often curved in the form of a horseshoe around an intruded portion of the putamen, with uniform or ruminate albumen or exalbuminous, embryo with the cotyledons appressed or divaricate,—(climbing or twining shrubs or more rarely perennial herbs or) trees Leaves alternate, exstipulate, usually palminerved, entire or lobed. Flowers small or minute, fascicled, cymose racemose or panicled, rarely solitary.

An order containing several genera of creepers but of no interest to the forester. The only tree or shrub being a species of *Cocculus*, a small tree common in sholas on the higher ranges of the Anamallays.

COCCULUS. *DC.*

Gen Pl. i. 36 —*Gen char.*: Sepals 6, in 2 series, 3 inner larger. Petals 6, shorter than the inner sepals, entire or bidentate, concave or with involute margins embracing the stamens. Male flower: Stamens 6, free with 4-lobed anthers. Female flower: Staminodia 6 or 0 Carpels 3, with erect or recurved undivided styles. Drupes rotundate or obovate, compressed, with the scar of the style near the base. Putamen tuberculate or transversely rugose. Seed horseshoe-shaped, curved around opposite intruded processes of the putamen; embryo with linear appressed cotyledons in a small quantity of fleshy albumen.

Cocculus laurifolius. *DC.*—A small tree or large shrub, leaves lanceolate coriaceous glabrous shining acute or acuminate mucronulate 3 nerved, 3 6 inches long, 1 1½ broad, petiole ½ ¾ inch long, panicles axillary or a little above the axils solitary or 2 superposed, 1-2 inches long, corymbose, the male generally the larger, bractes minute early deciduous, flowers minute, exterior sepals a half shorter than the interior acute, petals deeply 2 lobed, lobes obtuse or acute, sterile stamens 6 in the female flower, ovaries broadly oval, style cylindrical reflexed-drupe small rotundate. *H f. et T. Fl. Ind.* 1. *p.* 191. Menispermum laurifolium, *Roxb. Fl. Ind* iii. 815.

A small tree common in the moist woods on the higher ranges of the Anamallays 5-7,000 feet, and also found on the Himalayas and in Japan.

Analysis of Genera. Pl. II.

Male and female flower and fruit cut open of Cocculus cordifolius.

BERBERIDACEÆ.

Flowers hermaphrodite. Sepals petaloid, usually 3-6-9, and petals 6 or more, fewer or 0, free, hypogynous, early deciduous, all or the inner imbricate in æstivation. Stamens usually 6 or 4, free hypogynous, opposite to the petals; anthers erect, 2-celled, usually dehiscing by valves. Pistil of a solitary, free carpel; ovary 1-celled; stigma usually with a peltate, discoid or dilated stigma, sessile or with a short style. Ovules few, basal or several on the ventral suture, anatropous. Fruit an indehiscent drupe. Trees and shrubs. Leaves alternate fasciculate or radical, simple (unifoliolate) or compound. Flowers racemose paniculate cymose or solitary, usually yellow or white. An order represented in S. India by only two small trees.

BERBERIS. *L.*

Gen. char.: Sepals 6 9, petaloid. Petals 6, about the same size or little smaller than the sepals. Stamens 6; anthers dehiscing upwards in two valves, stigma peltate. Ovules few, erect. Shrubs with the first leaves of the shoots often reduced to spines, bearing the fasciculate 1-foliolate leaves in their axils. Flowers yellow, racemose, fasciculate or solitary.

Berberis aristata. *DC. Sys. Veg.* xi. 8.—A shrub leaves simple coriaceous more or less persistent usually obovate or oblanceolate, spinuloso serrate or entire about 1 inch long, spines deeply divided into 3 sharp rigid segments, racemes pendulous or suberect longer than the leaves, pedicels slender petals distinctly biglandular, filaments without teeth, stigma of the ovary and fruit supported on a short style. Berberis tinctoria. *Lesch. WA. Prod. p.* 16.

A large shrub or small tree common on the higher ranges of the mountains on the western side of the Madras Presidency, and in Ceylon and the Himalayas, it is very closely allied to the common Barberry (B. vulgaris) which is found on the Himalayas and in Europe, and which differs principally in its sessile stigma; the wood and the root contain a useful yellow coloring matter, and both the root and fruit are used medicinally.

2. Berberis Nepalensis. *Spr.*—A small tree bark very rough with deep fissures, leaves pinnate, leaflets 6-12 pairs, ovate nearly equal in size, slightly cordate at the base repand with 6-8 thorny teeth at each side about 5-nerved at the base, lower pair of leaflets close to the stem, racemes elongated slender, bracteoles at the base of the pedicel, oblong obtuse, petals with 2 distinct glands, filaments without teeth: berry globose crowned with the evident style and stigma. *Spr. Sys* ii. 120;—*Hook. & Thom. Fl. Ind, p.* 219. B. Leschenaultii, *Wall. l n.* 1479,—*WA. Prod. p.* 16 Mahonia Nepalensis, *DC. Prod,* 1.109.

A small tree common on the Nilgiris and Western ghats in the Madras Presidency, from 5000 feet and upwards, inhabiting also the Himalayas and Khasya mountains, the Nilgiri species was considered distinct by Dr. Wallich, and named after M. Leschenault but it is not separable from the N. Indian tree.

The wood is of a most brilliant yellow color, and might be used for inlaying purposes; it is however rather soft and porous. The tree is called Jakkahi on the Nilgiris, is very ornamental, and often planted in gardens; though always a small tree in S. India it is seldom more than a shrub in the North.

Analysis of Genera. Pl. II.

Dissections of the flower and fruit of Berberis Nepalensis.

CAPPARIDACEÆ.

Flowers regular or the sepals or petals sometimes unequal, rarely polygamous. Sepals 4, rarely 3 or 5, free or connate below valvate, imbricate or open in æstivation. Petals 4 or 0, rarely 3 or indefinite, sessile or clawed. Torus sometimes with a linear, oblong or ligulate-tubular appendix. Stamens definite or indefinite, inserted upon the torus, which is sometimes shortly columnar, or the filaments adherent more or less to the gynophore; filaments equal or unequal usually filiform; anthers usually oblong or linear, 2-celled, dehiscing longitudinally (some of them effete in certain species). Ovary sessile or supported upon a gynophore of various length, usually ovoid, globose or oblong, 1-celled or divided by spurious dissepiments into 2 or more cells. Ovules indefinite, sometimes few, parietal. Fruit a siliquiform capsule, or baccate, oblong, globose or elongate, cylindrical or torulose, many-or few, rarely 1 seeded. Seeds usually more or less reniform, or somewhat angular in baccate fruits with a crustaceous or coriaceous testa; albumen thin or 0. Embryo usually curved; cotyledons plane, folded or convolute; radicle often conical and incumbent. (Herbs) shrubs or trees, often scandent, glabrous pubescent tomentose glandular or scabrid. Leaves alternate rarely fasciculate, simple or 3-7-foliolate, leaflets usually entire; stipules, when present, minute or represented by short spines. Flowers axillary or terminal, solitary racemose corymbose fascicled or umbellate, often showy.

An order of no importance to the forester, being only represented in S. India by 4 small trees, viz. 2 belonging to the genus Capparis, and 2 to Cratæva, and a few shrubs; the genera Gynandropsis, Cleome, Polanisia. Niebuhria and Cadaba yield herbaceous plants or very small shrubs. Cratæva religiosa will be figured in the plates, and analysis of 1 species of Capparis is here given:—

Leaves simple, branches often spinose..... Capparis.

Leaves trifoliate, unarmed..... Cratæva.

CAPPARIS. *L.*

Gen. Pl. i. 108.—Sepals 4 (very rarely 5), free or connate at the base (or united and splitting irregularly in some species), equal or the two outer broader and more concave or the two inner petaloid, imbricate or valvate, or in two series, the outer pair valvate in æstivation. Petals 4. Stamens indefinite (8-∞), inserted upon the torus Filaments free. Ovary upon a gynophore usually from ¼ to 2 inches in length, 1-celled or sometimes few-celled, with 2 or more parietal placentas; ovules usually indefinite; stigma sessile. Fruit stipitate with one or many seeds, indehiscent or sometimes separating into 3 or 4 valves. Trees or shrubs (often climbing or sometimes prostrate), unarmed or with short, often recurved, stipular spines. Leaves simple, coriaceous or submembranous, rarely wanting. Flowers usually hermaphrodite, solitary, racemose, corymbose, or umbellate, axillary or terminal.

Capparis aphylla, *Roth. Nov. Pl. Sp.* 238—A much branched, glabrous tree or shrub. Branches terete, leafless, excepting in young plants and on barren shoots, usually with short, nearly straight or ascending stipular spines. Leaves, when present, linear or linear-lanceolate. Flowers red, about 1 inch in diameter, in lateral and terminal fascicles or corymbose racemes. Pedicels ½ inch or shorter. Sepals unequal in breadth; the anterior outer sepal larger and deeply saccate, but slightly imbricate or subvalvate (at least the 2 outer) in æstivation. Ovary on a gynophore of ½-¾ inch. Style about half as long as the ovary. Fruit ovoid red size of a cherry, pointed or subglobose, several or many-seeded. *C. Sodada*, Brown in Denham and Clapp. App. 20. *Sodada decidua*, Forsk. *Fl. Ægypt.* 81; Delile *Fl. Ægypt. t.* 26.

A small tree found in the Coimbatore, Madura and Tinnevelly districts, also in the Punjab, Guzerat and the Dekhan, delighting in an arid climate; its general girth is only about 2 feet, but one of 8 feet in girth has been mentioned by Mr. Edgeworth. It is commonly used for fuel, burning with a strong flame even when green; its wood is also stated to be durable, and from its bitter qualities, not liable to the attacks of white-ants; it is used for rafters, ploughshares and for knees in boat building. The fruit is eaten by the natives.

Capparis stylosa, *DC. Prod.* 1. 246.—A small tree or large shrub, stipules thorny short straight, leaves from exactly linear to elliptical mucronate glabrous 5 nerved at the base otherwise feather-nerved, nerves parallel nearly simple converging towards the point of the leaf, pedicels short stout axillary solitary 2 or 3 times longer than the petiole, 1 flowered, flowers rather large green, ovary smooth oblong furrowed, fruit size of a billiard ball, scarlet, warted, with 6 ridges.—*WA. Prod. page* 25. Capparis divaricata, *WA. Prod. p.* 27, *and Wight. Ic.* 889.

Very common both as a shrub and small tree all over the Coimbatore district, Madura, Salem, &c., and in the Dekhan; as a shrub it has a very narrow linear leaf only 1 line in breadth, and apparently never flowers in that state; as a tree the leaves are much broader; its wood is used as fuel.

Analysis is given of the flower of this species.

Capparis grandis. *Linn.*—A small tree, trunk thick tolerably straight but of no great height; branches numerous spreading. Thorns small stipulary recurved or often wanting, leaves attenuated short petioled oval to ovate acute or obtuse or emarginate; when young covered with a greyish tomentum at length glabrous about 2 inches long and 1½ broad; racemes terminal many flowered corymbiform, calyx of 4 unequal sepals, petals 4 oblong waved unequal very globose 2 seeded a little larger than a cherry.—*DC. Prod.* 1. *p.* 248. C. maxima, *Heyne DC.* 1. 248. Capparis bisperma, *Roxb. Fl. Ind.* ii. 568;—*Wight. Ic. t.* 21.

This tree is very common on the Eastern ghats of the Madras Presidency and on the Kurnool mountains, and is found sparingly in other parts all over the Presidency, and in Bombay, in the Godavery forests it is called Regguti in Telugu, but I never heard Roxburgh's name of Guli given to it. The wood is hard, heavy, and durable, and is much used by the natives.

There are a good many other species of Capparis, but they are only straggling shrubs or climbers, or thorny hedge plants, and need not be recorded in this work

CRATÆVA. LINN.

For Gen. Char. and description of C. religiosa, *Forst*, see letter press to the plates of that species.

2.—CRATÆVA NURVALA. *Ham.* A small tree or shrub, leaves trifoliate, leaflets ovate-lanceolate acuminate, lateral ones unequal at the base, limb of the petals ovate roundish, stamens numerous, torus hemispherical, berry ovoid.—*Ham. in Linn. Soc. Trans.* 15, *p.* 121 ;—*Rheed. Mal.* 3. *t.* 42.

A small tree or shrub common in Malabar, Mysore and Bombay ; it scarcely differs from C. religiosa (Roxburghii of *R. Br.*) except in the leaflets being ovate-lanceolate instead of obovate, and in the shape of the fruit. The leaves, bark, root and seeds are used medicinally by the natives ; it is called Nirvalá in Malabar.

Analysis of Genera. Pl. II.

Dissections of the flower and ovary of Capparis stylosa.

MORINGACEÆ. (By Prof. Oliver).

Flowers irregular, hermaphrodite, calyx 5-partite, with a short, cup shaped tube and unequal imbricate, at length spreading or reflexed segments, Petals 5, similar in form to the calyx lobes, 2 upper smaller. Stamens 5, alternating with 5 staminodes or 10 declinate ; filaments free, inserted in the margin of the disk ; anthers 1-celled, dorsifixed. Ovary 1-celled stipitate ; style terminal, slender ; ovules indefinite, anatropous, pendulous on 3 parietal placentas. Capsule siliquiform, 3-6 angled, 3-valved, many seeded. Seeds rather large, with or without wings, exalbuminous ; radicle superior. Trees with 2-3 pinnate leaves, clustered at the ends of the branches ; leaflets obovate or obovate-oblong, often caducous, or the leaves reduced to the jointed rachis. Panicles ample, hoary or glabrous, of rather large whitish pale yellow or red flowers. Capsules 6-20 inches in length.

A small and anomalous family of doubtful affinity, based upon the single genus. Confined to India, E. tropical Asia, and warm regions between.

MORINGA.

Juss. Benth. et Hook. f. Gen. Pl. 1. 430. Char. of the genus that of the order.

M. PTERYGOSPERAM. *Gærtn.* For description, vide letter press to the plate.

BIXINEÆ. (By Prof. Oliver.)

Flowers regular, hermaphrodite or 1 sexual. Sepals 3-8, free or united below, imbricate or rarely subvalvate in æstivation. Petals as many as the sepals or numerous or wanting, imbricate or contorted. Stamens hypogynous, indefinite ; anthers 2-locular, dehiscing longitudinally or by terminal slits. Torus with or without a thickened disk. Ovary free, 1-celled or with the walls intruded so as to be spuriously multilocular ; placentas usually 2-many, with many or few, more or less anatropous ovules. Fruit capsular or baccate, separating into as many valves as placentas or indehiscent. Seeds few or many, usually with fleshy albumen, and an axile, embryo with broad cotyledons. Trees or shrubs, sometimes armed with axillary spines. Leaves alternate, simple. Stipules minute or 0. Flowers axillary or terminal or from the old wood, solitary, fascicled, racemose or panicled, in some of the petaloid genera large and showy ; in the diœcious genera insignificant.

An order represented by 8 Indian genera of trees but with the exception of *Hydnocarpus* not of much importance to the forester. Cochlospermum has only one Indian species, a tree with a soft worthless timber, but with handsome large yellow flowers of great beauty. *Bixa*, 1 species an introduced tree common in gardens. *Scolopia* several trees with generally very spiny trunks. *Flacourtia* 5 species usually spiny. *Hydnocarpus* 4 species, 1 of which is confined to Ceylon. *Erythrospermum*, *Aberia* and *Trichadenia* a single species each, and all confined to Ceylon. Little or nothing is known of the timber of the different species of *Scolopia* and *Flacourtia* or of the 3 last mentioned genera. *Bixa Orellana Scolopia crenata* and *Hydnocarpus alpinus* will be figured in the plates ; and dissections are here given of *Flacourtia, Erythrospermum, Aberia* and *Trichadenia.*

COCHLOSPERMUM. KUNTH.

Benth & Hook. Gen. Pl. 1. 124. Flowers hermaphrodite. Calyx of 5 unequal, imbricate sepals. Petals 5, large, contorted-imbricate in æstivation. Stamens indefinite, free, with oblong or linear anthers, opening by a short porelike slit at the apex, on the inner face. Ovary 1-celled, with 3-5 projecting, multi-ovulate placentas. Style undivided, slender. Stigma simple, obtuse or minutely toothed. Capsule somewhat papery, separating into 3-5-valves when ripe, each valve alternating with a corresponding valve of the submembranous endocarp. Seeds numerous, reniform or spirally twisted, covered or fringed with long cottony hairs ; testa horny ; embryo curved. Shrubs or trees, affording a yellow dye. Leaves alternate, palmately-lobed. Flowers, showy yellow, pedicellate, fascicled, racemose or panicled, either terminal or from the upper axils or from the old wood of the stock.

COCHLOSPERMUM GOSSYPIUM. *DC.*—A tree unarmed, trunk erect, bark smooth ash-coloured, leaves scattered about the ends of the branchlets 3-5 lobed, 2 to 8 inches long above pretty smooth, below covered with whitish down, the lobes entire acute, petioles as long as the leaves, stipules linear acute caducous, flowers terminal numerous panicled very large bright yellow, bracts stipule like caducous, calyx 5 leaved leaflets oblong concave, petals 5 obliquely obovate, obliquely and deeply emarginate or rather cleft, spreading, filaments numerous short distinct anthers linear nearly as long as the filaments, style rather longer than the filaments but bent to one

side, stigma simple, capsule broad, turbinate sub-globular as long as a goose's egg, 5 lobed, seeds numerous kidney-shaped woolly.—*DC. Prod.* 527. Bombax gossypium, *Roxb. Fl. Ind.* iii. *p.* 169.

A tree very common on the mountains on the eastern side of the Presidency and about the dry slopes of the Nilgiris, Salem, Madura, Travancore, Mysore, &c. and in Bengal; its very handsome flowers appear in February or March when the tree is destitute of leaves; the timber is soft and valueless, and the cotton is of no value except for stuffing pillows, &c. The gum which exudes from the trunk is officinal. The tree is occasionally met with in gardens, and is well worth cultivating for the beauty of its flowers and foliage.

BIXA. Linn.

For Gen. char. and description of the species B. orellana, see letter press to plate.

SCOLOPIA. Schred.

For Gen. char. and description of *S. crenata* see letter press to the plate of that tree.

2.—S. Chinensis. *Clos.* A middling sized tree, trunk armed with large compound spines, branches generally unarmed, leaves oval obscurely serrated towards the apex 1½-2¼ inches long, 1-1½ broad, obscurely and very shortly acuminate at the apex, rounded or retuse, petioles ¼ inch long, berry size of a pea subglobose pulpy reddish black. *Clos. in Ann. des. Sc. Nat. Ser* 4, *VIII. p.* 249;—Phoberos chinensis, *Lour.* Phoberos Arnottianus, *Thw. En. Pl. Zey. p.* 16 *and p.* 400.

Introduced to South India and Ceylon from China.

3.—S. Gœrtneri. *Thw.* A middling sized tree, trunk armed, leaves reticulated on both sides with prominent veins very variable in shape lanceolate to oblong, ovate or rotundate, cordate 1-2 inches long, by ½-¾ in broad, sepals 10 rounded obtuse, berry subglobose size of a pea pulpy reddish black. *Thw. En. Pl. Zey. p.* 17 *and* 400. Scolopia pusilla, *Clos. l. c.*

Ceylon sea coast up to 1,500 feet called Katu Kurundo; the variety with lanceolate leaves may, Dr. Thwaites thinks, possibly be a distinct species. Wood hard, strong and elastic.

4.—S. acuminata, *Clos. l. c.* A middling sized tree spiny when young, at length unarmed, leaves glabrous ovato-lanceolate with a long acumination, serrated towards the apex below the acumination narrowed at the base 2-3½ in. long, 1-1¾ broad pale beneath, obscurely and finely venose, petioles 2-3 lines long sepals 10-12 broadly lanceolate, berry subglobose size of a cherry green firm and fleshy—*Clos. l. c.* Phoberos acuminatus, *Gard. Thw. En. Pl. Zey. p.* 17 *and* 400.

Ceylon from 1,000 to 3,000 feet elevation.

5.—S crassipes. *Clos.* A very large tree, when young spiny, at length unarmed, leaves ovate sub-acuminate, narrowed at the base, margin slightly undulate 1¼-2 inches long ¾-1 inch broad, very coriaceous reticulated beneath with prominent veinlets, petioles scarcely 2 lines long, sepals 12-14 oblong, berry size of a cherry or larger green fleshy and firm.—*Clos. l. c.* Phoberos Hookerianus, *Wight MSS. Thw. En. Zey. p.* 17 *and* 400.

Ceylon 4,000 to 7,000 feet elevation.

6.—Scolopia Wightiana. A good sized tree, exceedingly thorny, leaves roundish ovate with a short obtuse acumination without glands at the base, scarcely serrate, the serratures often resembling mere glands, very coriaceous and hard, beneath somewhat prominently reticulated. Flacourtia Wightianus, *WA. Prod. p.* 30.

Nilgiris.

ERYTHROSPERMUM. Lam.

Benth. and Hook. Gen. Pl. 1. 127. Flowers hermathrodite, sepals 4-6 much imbricate, petals 5-6, stamens 5 inserted on to the torus which has no glands, anthers lanceolate-sagittate scarcely shorter than the filaments, connective dilated, ovary stipitate, placentas 3-4, many ovuled style short, stigma entire or 3-4 cleft, capsule 3-4 valved 1-few seeded, testa coriaceous, embryo slightly incurved. Trees or shrubs, leaves entire.

E. phytolaccoides, *Gard.*—A middling sized tree 20-30 feet, branches glabrous terete, leaves alternate rather distant oblongo lanceolate acuminate acute at the base, very glabrous on both sides shining above paler beneath entire or obscurely serrate reticulated with prominent veins, 3½ 8 inches long, 1½-3 inches broad, petioles 3 8 inches long, sulcate above, swollen at the base and apex, stipules minute lanceolate, racemes many flowered paniculate terminal or axillary, about equalling the leaves, peduncles glabrous; pedicels 2-3 lines long, 3 bracteolate at the base, sepals 5 white tinged with red ovate obtuse concave about 2 lines long, petals white ovato-oblong obtuse ciliate when very young, equalling the sepals, anthers saggitate, ovary oblong glabrous stipitate capsule globose 3-5 lines in diameter, 3 4 valved nearly to the base, 1-few seeded.—*Gar. in Calc. Journ. of Nat. His. vol.* vii, *p.* 11;—*Thw. En. Pl. Zey. p.* 18.

Ceylon up to an elevation of 1500 ft.

FLACOURTIA. Commers.

Benth. and Hook. Gen. Pl. 1. p. 121.—Flowers diœcious or rarely bisexual, calyx 4-7 parted lobes sometimes unequal imbricate petals 0. Male flowers: stamens very numerous with small roundish or subdidymous 2-celled unappendaged anthers attached at the back and dehiscing longitudinally, ovary O. Female flowers: stamens O, ovary surrounded by an annular or interrupted disk, usually 4-8 celled with a pair of superposed ovules (the upper ascending the lower pendulous) in each cell, the upper and lower ovules separated at length by spurious dissepiments. Styles 4-8 more or less radiating persistent, stigmatic apices retuse or emarginate; bisexual flowers having the characters of both the male and female; fruit a berry 5-16 celled, seeds bony. Trees or shrubs frequently spinose with alternate simple leaves, flowers small in terminal or axillary racemes or fascicles or small panicles, or the female often solitary; fruit often edible.

FLACOURTIA RAMONTCHI. *L'Herit. Strip. Nov.* 59, *t.* 30. 30 *β.*—A small glabrous tree or shrub or with the young parts and petioles obsoletely puberulous, frequently armed with acute, axillary ascending or spreading spines, 1-2 inches in length. Leaves shortly petiolate, glabrous at length shining, and when dry veiny above broadly elliptical or varying from obovate to oblong-elliptical; apex usually rounded and obtuse, sometimes broadly pointed; base rounded or more or less cuneate, broadly (sometimes obscurely) crenate or crenate-serrulate, 2-3½ inches long, 1¼-2¼ inches broad, petiole 3-5 lines. Flowers 1-2 lines in diameter, in short few-flowered terminal racemes or terminating short lateral shoots. Fertile flowers perhaps usually solitary. Styles 5-7, very short, radiate, each longitudinally grooved above. Fruit a roundish, pulpy, edible berry, ½-1 in. diameter with about 10 seeds.—*Roxb. Fl. Ind.* iii. *p.* 834. F. sapida, *Roxb. l. c. p* 835.

A native of various parts of the Presidency and in Bengal and Bombay, called Pedda Kàuru and Kànregu in Telegoo, and Kànju in Hindostanee. The timber is straight and close grained, but too small to be of much use; it is sometimes used for ploughs and in turnery, and for carts; the fruit is eaten.

2.—F. INERMIS, *Roxb.* A middling sized tree, unarmed trunk short soon dividing into numerous branches forming a dense head, bark smooth brownish and without any thorns, leaves alternate short petioled elliptic smooth of a shining green on both sides and reddish when young, racemes axillary short, flowers hermathrodite, calyx 4 5 parted, stamens about 20 inserted on to the annular disk which surrounds the base of ovary, ovary 5-celled with 2 ovules in each attached to the middle of the axis, style 5-6 radiating, berry size and appearance of a red cherry and very smooth, seeds as far as 10.—*Roxb. Fl. Ind.* iii. 833.

Found in many parts of the Madras Presidency, but perhaps introduced; the tree is very ornamental, the fruit is eaten and makes good tarts; the tree flowers in the hot weather, and ripens its fruit in September. I know nothing of its timber; it is called Ubbolu in Canarese.

3.—F. CATAPHRACTA, *Willd.* A middling sized tree, trunk short armed with numerous large decompound thorns, bark pretty smooth, branches numerous, generally unarmed except close to the trunk, leaves alternate short petioled ovate oblong serrulate smooth shining green on both sides 2-3 inches long, racemes axillary small 5-10 flowered, a small cordate bract below each pedicel, male calyx 4 5 parted stamens inserted into a glandular convex receptacle, female calyx of 4-6 spreading sepals with an annular lobed disk surrounding the ovary, styles 4-6 radiating, berry size of a common plum globular smooth purple succulent 8-12 seeded, seed hard sharp edged.—*Roxb. Fl. Ind.* iii. *p.* 834.

Malabar, South Canara and Bombay; the fruit is edible.

4.—F. SEPIARIA, *Roxb.* A shrub with large simple thorns which are often leaf and flower bearing, leaves obovate or round serrate smooth, peduncles axillary and terminal; berries size of a pea about 5-seeded.—*Roxb. Fl. Ind.* iii. *p.* 835;—*Rheed Mall.* v. *t.* 39.

A common shrub throughout the Madras Presidency, Bengal and Bombay, called in Telugu Kanru; it is of no use except for firewood.

5.—F. MONTANA, *Graham.* A middling sized tree with an armed trunk, young shoots with axillary thorns, leaves ovate oblong crenate, fruit scarlet of the size of a large cherry.—*Dalz. Bombay Flora p.* 10.

Common on the Bombay ghats; native name Attak; the fruit is agreeable and slightly acid.

ABERIA. HOCHST.

Flowers diœcious, sepals 5-8 imbricate, petals 0. Male flower: stamens indefinite, anthers shortly oblong introrse dehiscing longitudinally, rudiment of an ovary none or very small, no hypogynous disk. Female flowers: calyx as in the male persistent, stamens 0, ovary seated on an hypogynous crenulated disk, placentas 5-7 (2 ovulate) very prominent and nearly meeting in the centre, and so forming a 5-7 celled ovary, styles as many as the placentas, berry 1-6 celled, seeds 1-6 attached to the walls of the cavities. Small trees with or without spines, leaves alternate simple, fruit edible.

ABERIA GARDNERI, *Clos.* A middling sized tree 16-20 feet, unarmed, branches terete tuberculate, young ones tomentose, leaves ovate oblong or oblong lanceolate acuminate subobtuse at the base, entire or dentate serrate, above pubescent, beneath tomentose, about 4 inches long by 2 broad, petioles about 4 lines long, costa and primary veins reddish, male peduncle short often twin, pedicels 10-20 umbellate about 4 lines long pubescent, calyx lobes lanceolate acute pubescent, filaments filiform equalling the segments of the calyx, female pedicels 1-3, calyx lobes as in the male, ovary densely pubescent subglobose, styles diverging 1½ lines long pilose, berry about 1 inch in diameter.—*Clos. in Ann. des Sc. Nat. ser.* 4. viii. *p.* 236. Roumea hebecarpa, *Gard. in. Calc. Journ. of Nat. His. vol.* vii. *p.* 9;—*Thw. En. Pl. Zey, p.* 18 *and p.* 400.

Ceylon, called Katambilla; the acid fruit is eaten.

TRICHADENIA. THW.

Flowers diœcious, calyx gamosepalous entire calyptriform at length irregularly cleft, petals 5, hypogynous imbricate, squamules 5 lanceolate opposite to the petals fleshy hirsute. Flowers male, stamens 5 alternate with the petals, spirally contorted in æstivation, filaments thick slightly pilose at the base, anthers oblong dehiscing longitudinally, rudiment of ovary none. Flowers female, staminodia none, ovary sessile free 1 celled, placentæ 3, 1 ovuled, ovules suborthotropal horizontal; styles 3 diverging, stigmas broad reniform crenate, berry spherical 1-3 seeded, testa long, embryo orthotropal in the axis of the fleshy albumen, radical short cylindrical, cotyledons foliaceous plicato rugose. A tree, leaves penninerved, stipules foliaceous caducous, panicles axillary.—*Thw. in Hook. Kew. Journ.* vii. 196.

TRICHADENIA ZEYLANICA, *Thw.* A large tree, young branches tomentose, leaves alternate petioled, oblong penninerved coarsely dentate or sinuate towards the apex, narrowly acuminated at the apex, rounded at the base, 5-12 inches long by 2-4 broad, petioles 2-3 inches long, stipules foliaceous concave caducous, panicles racemiform axillary shorter than the leaves, flowers 6 lines broad, pale green, fruit globose 9-11 inches in diameter—*Thw. Hook. Kew. Journ.* vii. 196, *t.* 5;—*En. Pl. Zey. p.* 19.

Ceylon, at an elevation of about 3000 feet, not uncommon, called Tatti. The oil extracted from the seed is used for diseases of the skin.

HYDNOCARPUS. GŒRTN.

For Gen. char. and description of H. alpinus, see letter press and the plate of that species.

2.—H. WIGHTIANA, *Bl.* A middling sized tree, young branches glabrous or slightly silky with golden pubescence as is the inflorescence, leaves elliptic oblong, acutely serrate 5-7 inches long by 1½-2 inches broad, peduncles axillary subracemose few flowered, sepals unequal, the 3 inner ones longer, petals broad ovate fringed with soft white hairs, scales broad ovate about ½ the length of the

petals densely hairy, stamens as long as petals, filaments subulate, anthers broad reniform, pistil none; female as in the male, anthers sterile, placentas corresponding in number to the lobes of the stigma, fruit obtusely angled.—*Bl. in Rhumphia* iv. *p.* 22. Hydnocarpus inebrians, *Wight Ill. t.* 16 and *p.* 37; and *WA. Prod. p.* 30—(not *Vahl.*)

A very common tree in the plains of Malabar and all the ghat forests on the western side of the Presidency, up to about 2000 feet elevation; it is called Maravetti in Tamil, and on the Anamallays the Kaders call it Yetti maram; the fruit is used to intoxicate fish; the wood is used for various purposes by the natives; it differs from the true inebrians with which Dr. Wight has confounded it, in the fruit being obtusely angulate, and in the flowers being subracemose instead of cymose. I find however that the young ramuli of this species are generally silky, and the stipules are not as persistent as Dr. Wight's figure would lead one to believe.

3.—H. INEBRIANS, *Vahl.* A large tree, young branches rufo-tomentose, leaves lanceolate acuminate obtusely serrate or subentire, more or less narrowed at the base, suboblique, sepals rounded, petals rounded ciliate 1½ lines long, scales rounded acuminate ferrugineo-strigose, berry about 1 inch in diameter subtorulose ferrugineo-tomentose at length black.—*Vahl. Symb. Bot.* iii. *p.* 100. H. venenata, *Gærtn. Fruct. et Pl.* i. *p.* 288. *tab.* 60. Marotti, *Rheed. Hort. Mal.* i. *p.* 65. *t.* 36;—*Thw. En. Pl. Zey.* 18.

Malabar coast, bearing the same name as the preceding species, and possessing the same qualities. Ceylon, up to 2000 feet, called Màkula. The oil extracted from the seed is used in cutaneous complaints.

4.—H. OCTANDRA, *Thw.* A middling sized tree 40-50 feet, bark smooth, young branches strigose tomentose, leaves alternate entire suboblique penniveined ovate lanceolate narrowed at both ends, obtusely acuminate 3-4½ inches long by 1¼-1¾ broad, glabrous above, furnished with black glandular dots beneath and hairy on the costa, petioles ½-¾ inch long, inflorescence stellately pubescent axillary fascicled, fascicles 2-8 flowered, flowers 5 lines broad, pedicels 3-4 lines long, sepals 5 oblong obtuse concave unequal, petals 5 rounded concave ciliate with white silky hairs, scales 5, opposite the petals and ½ their length, rounded obtuse or minutely apiculate sericeous; flowers male, stamens 8 in 1 series surrounding the rudiment of an ovary, filaments subulate, anthers adnate oblong; flowers female, anthers sterile, ovary oblong strigose, placentæ parietal 4, style none, stigma large 4 parted, berry spherical tomentose 1½-2½ inches in diameter, seeds 4-12 or more oblong 10 lines long 5 lines broad immersed in soft pulp.—*Thw. in Hook. Kew. Journ. of Bot. vol.* vii. *p.* 197, and *En. Pl. Zey. p.* 19.

Ceylon in the Ambagamwa district, elevation about 2500 feet.

Analysis of Genera. Pl. ii. *Bixineæ.*

4. Flacourtia inermis, dissections of the hermathrodite flower.
   Flacourtia sapida, female flower; and young fruit cut transversely.
5. Aberia Gardneri, dissections of male and female flowers.
6. Erythrospermum phytolaccoides, dissections of flowers and fruit.
7. Trichadenia Zeylanica, dissections of flowers and ovary, shewing a flower bud with the calyx bursting irregularly; a male flower and female flower, a single petal and an ovary cut horizontally.

PITTOSPOREÆ. (By Prof. Oliver.)

Flowers regular, hermaphrodite. Sepals 5, free or slightly connate below, æstivation imbricate. Petals 5, exceeding the sepals free or connate below, more or less spreading above, æstivation imbricate. Stamens 5, hypogynous, free, alternate with the petals; filaments filiform or linear; anthers dehiscing longitudinally unappendaged. Ovary 2 rarely 3-5 celled or 1 locular with parietal placentas and indefinite ovules. Style simple, terminal; stigma minute or capitate, entire or toothed. Fruit a coriaceous capsule dehiscing loculicidally in two valves each bearing a septum on the middle. Seeds albuminous, with a minute embryo, testa smooth or rugose. Trees, shrubs or undershrubs. Leaves alternate simple entire wavy or toothed, exstipulate. Inflorescence various. An unimportant order containing 3 small trees all belonging to the genus Pittosporum.

PITTOSPORUM. BANKS.

Sepals free or slightly united at the base. Petals more or less spreading above, free or connivent or coherent into a tube below. Filaments subulate; anthers erect, ovate oblong. Ovary nearly or quite divided into 2 (rarely 3 or 5) cells by the projecting placentas. Capsule coriaceous or rather woody, globose or obovoid, dehiscing in two entire septiferous valves. Seeds various in form from mutual pressure, often imbedded in viscous fluid.

PITTOSPORUM FLORIBUNDUM. *WA.* A small tree, leaves thinly coriaceous glabrous elliptic lanceolate to oblongo-lanceolate, subacute or rounded at the apex, margin waved, 3-4 inches long, racemes terminal aggregated many flowered compact, flowers white small, peduncles glabrous, pedicels glabrous somewhat umbellate, sepals minute many times shorter than the corol ovate acute concave ciliate at the apex, petals linear, ovary hairy, style cylindric glabrous, stigmas 2 lobed, ovules 4-6 in each cell of the ovary, capsule size of a pea, nearly black when ripe 2 valved compressed 3-4 seeded, valves thinish, inside transversely wrinkled.—*WA. Prod. p.* 154. P. zeylanicum, *Wight Ill.* i. 173; and *Thw. En. Pl. Zey.* p. 68. Celastrus verticellatus, *Roxb. Fl. Ind.* i. 391.

Common along all the Western ghats of the Madras Presidency up to 4000 feet elevation, and in Ceylon; called Yekkadi in Bombay, and Katteya in Ceylon; also found in Nepal; the timber is strong and tough but of small size.

2.—P. TETRASPERMUM. *WA.* A small tree or large shrub, leaves elliptic oblong acute coriaceous glabrous margins slightly waved and recurved, flowers in a terminal sessile umbel, peduncles aggregated into a terminal sessile umbel, usually 1, rarely 2 flowered pubescent, sepals pubescent lanceolate acuminate minute many times shorter than the corol, petals linear, ovary hairy, style glabrous, stigmas 2 lobed, ovules 2 in each cell, capsule nearly globose, when mature compressed 4 seeded, valves thick coriaceous.—*WA. Prod. p.* 154.

Ootacamund and Ceylon, 5000-7000 feet elevation; flowers in February and March.

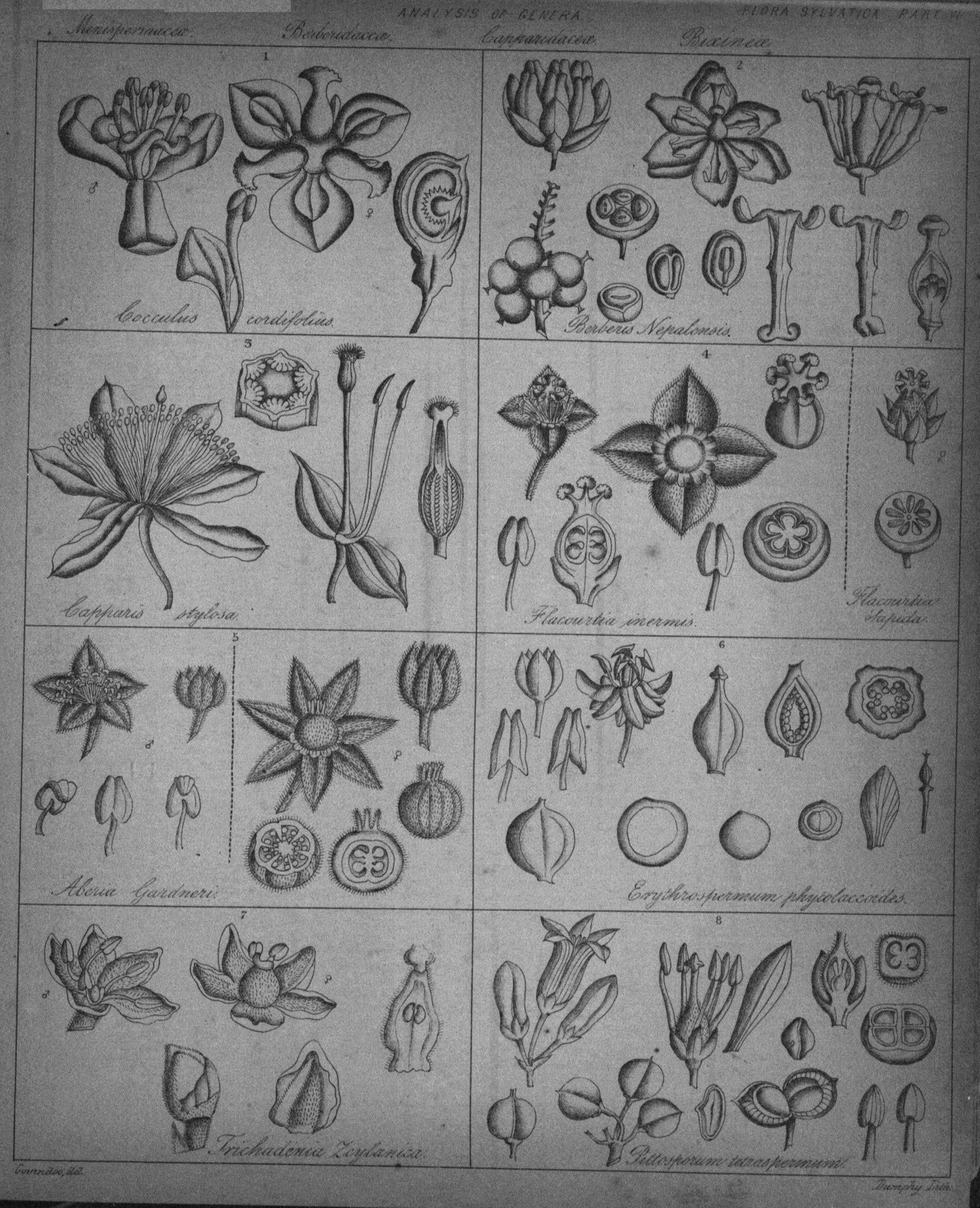
3.—P. NEILGHERRENSE. *WA.* small tree or shrub, leaves thinly coriaceous elliptic-lanceolate glabrous, racemes terminal 2-3 together 1-4 flowered lax, peduncles glabrous, pedicels glabrous slender alternate, sepals minute many times shorter than the corol, lanceolate acuminate flat glabrous slightly ciliated, petals linear, ovary hairy, style glabrous, stigma 2 lobed, ovules 4-6 in each cell, capsule yellowish green when mature compressed, 2 valved 4-6 seeded, valves thick between fleshy and coriaceous.—*WA. Prod. p.* 154.

Nilgiris; the flowers and fruit are much larger than in floribundum.

Analysis of Genera. Pittosporceæ Pl. II.

Fig. viii., dissections of flowers and fruit of Pittosporum tetraspermum.

Menispermaceæ. Berberidaceæ. Capparidaceæ. Buxineæ.



Gonnelow, del.

Humphry, Lith.

POLYALTHIA COFFEOIDES. (Nat. order Anonaceæ.)

For Gen. Char. see under "P. cerasoides."

POLYALTHIA COFFEOIDES. (Thw.) A good sized tree, young parts minutely puberulous, leaves lanceolate or oblongo-lanceolate glabrous on both sides shining above, (veins very prominent beneath) acute or rounded at the base, gradually attenuated into an obtuse point at the apex, margins slightly undulate, 4-10 inches long 1½-3 broad, petiole ¼ inch long, pedicels several together from woody tubercles about the trunk and larger branches or solitary or twin in the axils of the fallen leaves on the young branches, 1-1½ inches long, minutely adpresso-puberulous, articulated at the base, and furnished with 2-3 deciduous squamæ-form bracts, sepals nearly round, petals coriaceous, glabrous or slightly hairy, lanceolate, acute or obtuse at the apex, about an inch long, inner ones rather larger, carpels puberulous about 1 inch long ovoid attenuated at both ends on pedicels about 1 inch long, seed oblong, 7 lines long 5 lines broad, flowers cream-colored. Guatteria coffeoides. *Hook. and Thom. Fl. Ind. p.* 141.

A common tree in all the moist forests on the western side of the Madras Presidency, from 1,000 *to about* 3,500 *feet elevation, and in Ceylon. It is very abundant in the Wynad, where the Kurambars make ropes from the bark, which when fresh has a strong smell of ammonia. The tree is found in flower at all seasons but most plentifully so in March and April. I know nothing of its timber, the young leaves come out a most brilliant red color, and the tree is highly ornamental.*

Alexis, del.

Polyalthia coffeoides (H.f. et T.)

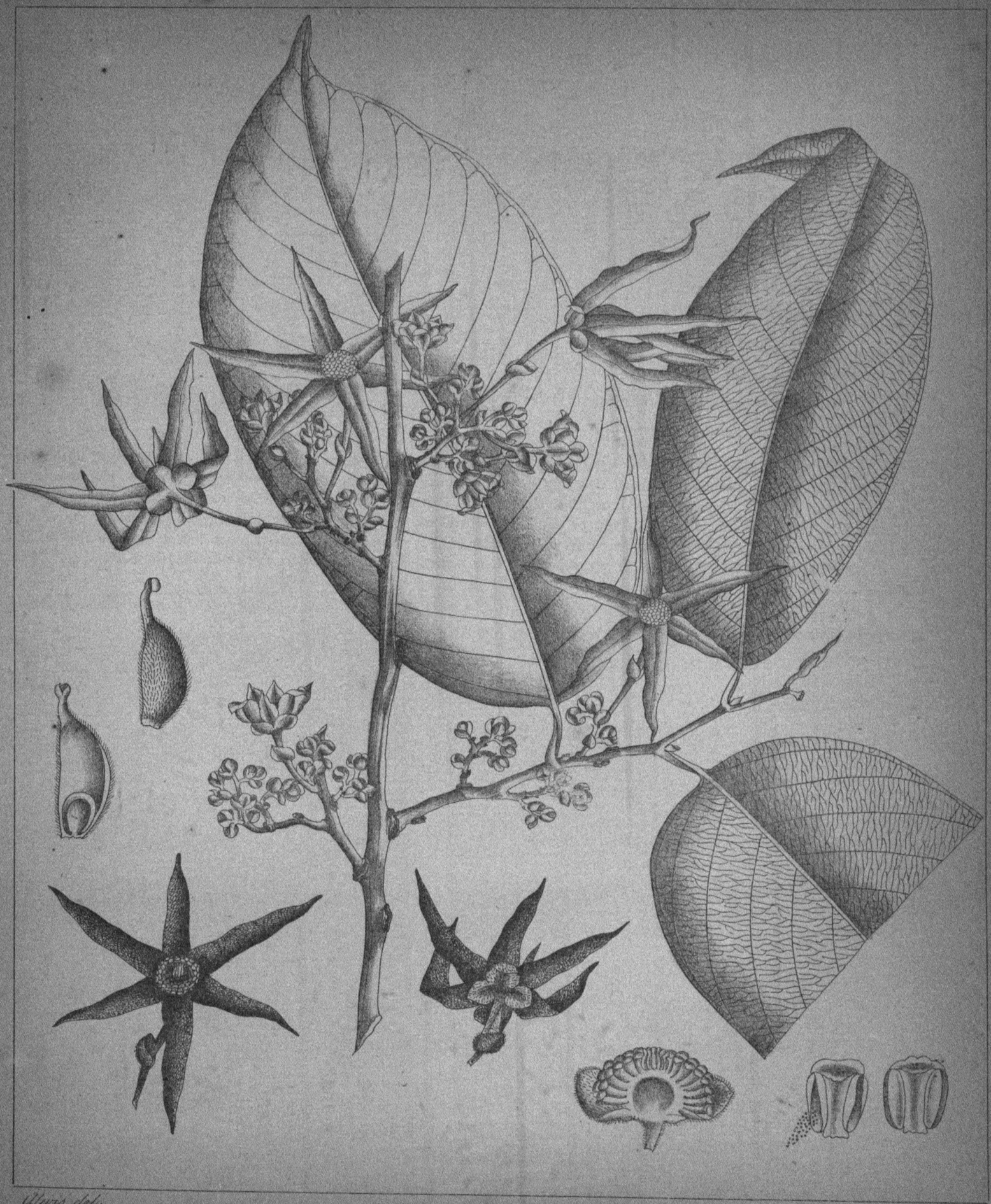
Dunephy, Lith.

POLYALTHIA FRAGRANS. (Nat. order Anonaceæ.)

For Gen. Char see under "P. cerasoides."

POLYALTHIA FRAGRANS. (Dalz.) A large tree, leaves ovate, oblong or oblongo-lanceolate, rounded at the base generally obliquo ; very prominently veined, especially beneath, glabrous above, slightly pubescent on the costa and veins beneath, 4-9 inches long 2-5 inches broad, petioles about ¼ inch long, peduncles about an inch long, from the axils of the fallen leaves, pedicels filiform, 1 inch long, and (as are the calyx and petals) hoary-puberulous, furnished with a half cup-shaped bract about the middle, sepals small rotundate, petals 1-1½ inches long narrow linear attenuated at the apex, sub equal , torus dilated depresso-globose, carpels 10-20 oblique ovoid 1-1½ inch long, hoary puberulous, long pedicelled. *Dalz. in Hook. Kew. Misc.* iii. 206 ;—*Hook and Thom. Fl. Ind. p.* 142.

A large tree common in the moist forests of the Anamallays, 2-3,000 feet, in Malabar, on the South Canara ghats and Bombay Presidency, and probably throughout the western ghats of Madras. I am unacquainted with its timber.



Ulvers, del.

Polyalthia fragrans (Dalz.)

Dorrington, Lith.

MITREPHORA GRANDIFLORA. (Nat. order Anonaceæ.)

MITREPHORA. (Blume.) *Benth. and Hook. Gen. Pl. p.* 26.—GEN. CHAR. Sepals 3 small, petals 6, valvate in 2 series, exterior large open furnished with veins, sometimes persistent (after the interior have fallen) and increasing in size, interior unguiculate connivent into a mitreform cap over the genitalia, stamens numerous densely packed oblong cuneate, ovaries numerous oblong, style oblong or truncate, ovules 4-many in one or 2 series on the ventral suture. Trees often of large size, leaves coriaceous.

MITREPHORA GRANDIFLORA. (Bedd.) A large tree, young parts minutely aureo-pubescent, leaves ovate lanceolate, or elliptic with a short blunt acumination, thinly coriaceous glabrous and shining above, glabrescent beneath, with hairy glands in the axils of the veins, 4-5 inches long by $1\frac{1}{2}$-$2\frac{1}{2}$ broad, petioles about $\frac{1}{2}$ an inch long, peduncles leaf-opposed furnished with a bract below each flower, 2-3 flowered shorter than the petioles, flowers subsessile, bud globose densely aureo-pubescent, exterior petals 1 to $1\frac{1}{4}$ inches long, by $\frac{5}{8}$ to $\frac{7}{8}$ of an inch broad densely adpressedly velutinous on the outside, sub-glabrous within, pure white turning to yellow, interior petals $\frac{4}{8}$ to $\frac{5}{8}$ of an inch long triangular at the apex, with a long broad claw, very hairy at the apex, glabrous below, white beautifully streaked with carmine, forming a mitreform cap over the genitalia, early deciduous, stamens and ovaries indefinite as in the genus, ovules 4-6 in 2 series, young carpels densely velvetty, mature about the size of a hazel-nut globose and 1 seeded, or oblong and 2 seeded fuscous with dense short tomentum, and furnished with a raised furrow down the whole length.

South Canara ghat forests, elevation about 2,000 *feet. A large very handsome tree; when in full flower it is very beautiful, its large flowers giving it at the distance more the appearance of a Magnoliaceous than an Anonaceous tree, the three inner petals or mitreform cap are early deciduous, but the three outer ones subsequently increase in size and turn from pure white to yellow; the timber is very tough. The specimen figured was gathered on the Coloor ghat.*

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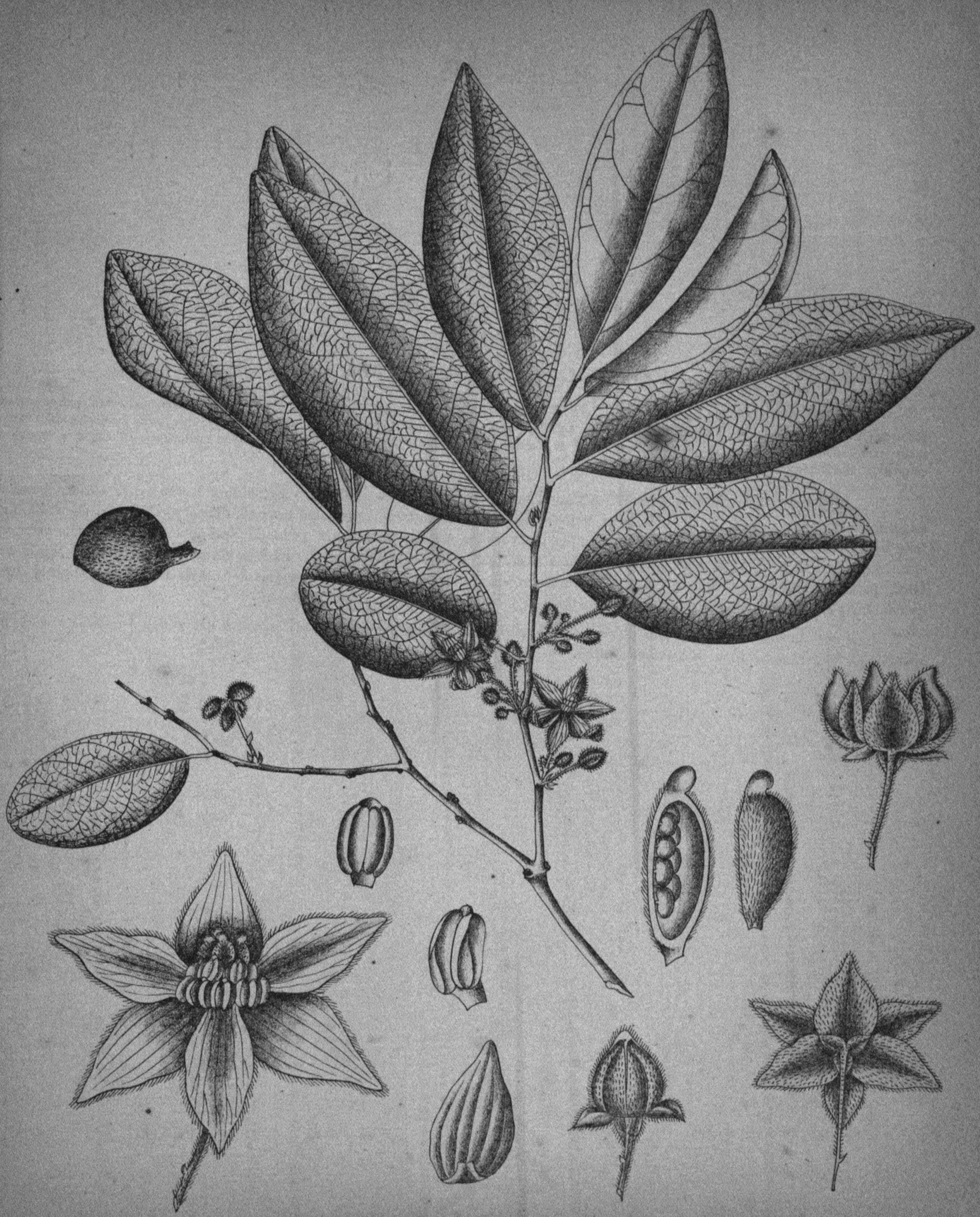
Gomez del. *Metrephora grandiflora (Bedd.)* Dampier Lith.

ALPHONSEA MADRASAPATANA. (Nat. order Anonaceæ.)

ALPHONSEA. (Hook. f. et. T.) *Gen. Pl. p.* 29.—GEN. CHAR. Sepals 3 small, petals 6, valvate in 2 series, subequal ovate open or spreading stamens 6 many, laxly imbricated, connective apiculate and slightly produced beyond the conspicuous dorsal anther cells; torus hemispherical, ovaries 4, many (rarely solitary) style oblong or depressed, ovules 4-8 in 2 series on the ventral suture (or rarely 1 erect), fruit pedicellate. Trees with very shining coriaceous leaves, flowers small fascicled.

ALPHONSEA MADRASAPATANA. (Bedd.) A tree, leaves glabrous, very shining on the upper surface, lanceolate or elliptico-lanceolate or occasionally oblong or ovate, coriaceous, prominently reticulated beneath, obtuse at the apex, about 3½ inches long by 1½ broad, petioles about ¼ inch long, rugulose glabrous or slightly puberulous, peduncles leaf-opposed or above the axils, very short, pedicels 1-6, ¼ to ½ an inch long, puberulous furnished with a bract below the middle, flowers bright yellow, sepals ovate small, petals about ⅜ of an inch long, puberulous on the outside, stamens 12 in 2 series, ovaries 3-4, style subglobose, slightly curved, ovules about 8 in 2 rows, carpels ovoid fulvo-tomentose.

A very handsome evergreen shade yielding tree, common on banks of streams on the Cuddapah and North Arcot hills, from no great elevation up to 3,000 feet. I am not acquainted with its timber; it is well worthy of cultivation.



Jacindoa del.

Adfuhonsea Madrasapatana (Bedd.)

Dunsphy Lith.

HYDNOCARPUS ALPINUS. (Nat. order Bixineæ.)

HYDNOCARPUS. (Gærtn.) *Benth and Hook. Gen. Pl p.* 129.—GEN. CHAR. Flowers diœcious, sepals 5 distinct much imbricated, petals 5, scales 5 opposite the petals. Male flower, stamens 5-8, anthers oblong uniform fixed on to the filaments at their base, no rudiment of an ovary. Female flower, staminodia 5 many, stigmas 3-6 as many as the placentæ in the ovary, sessile dilated, or on very short styles, fruit large globose, pericarp woody, seeds numerous with a crustaceous striated testa, albumen fleshy, cotyledons ovate foliaceous plane or subplicate. Trees, leaves shortly petiolate serrate or entire, racemes axillary few flowered. *Gært. Fruct.* 1. 288. *t.* 60.

HYDNOCARPUS ALPINUS. (Wight.) A very large ramous tree, 70-100 feet high, leaves alternate ovate acuminate entire glabrous 4 6 inches long by 1-2 inches broad, when young red, afterwards deep green, sepals all equal reflexed, petals ovate lanceolate glabrous, scales narrow lanceolate as long as the petals ciliated towards the apex ; male, stamens 5, filaments much shorter than the petals glabrous, anthers obtuse ; female, calyx, corol and stamens as in the male, but the latter sterile, stigmas 5 sessile obcordate spreading, fruit size of an apple clothed with short brown tomentum, seeds many, enclosed in white fleshy pulp, radicle elongate pointing to the hilum. *Wight. Ic. tab.* 942.

A very handsome tree with a beautiful foliage, common on the Nilgiris, up to nearly 6,000 *feet, and on the Calcad hills Tinnevelly, at an elevation of* 1,500 *feet, and probably throughout the western ghats of Madras ; also in Ceylon, elevation* 1,500 *feet, called Maratatti on the Nilgiris, where the wood is much used for beams and rafters for native houses ; it answers as deal for general purposes, packing cases, &c. ; it splits readily, and is a good firewood. The tree flowers in July and August.*

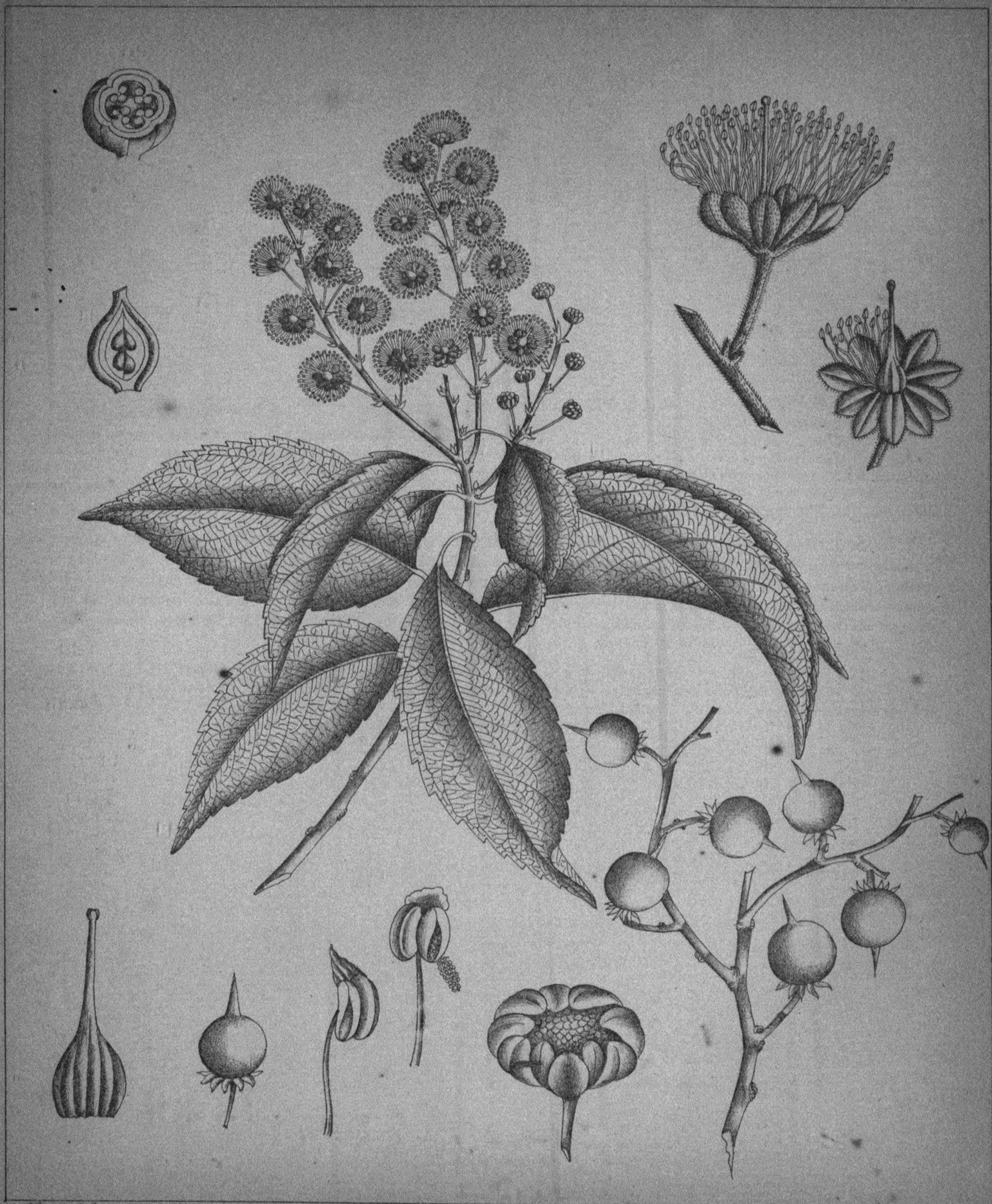
Flavis del. *Hydnocarpus alpinus (Wight.)* Dumphy. Lith.

SCOLOPIA CRENATA. (Nat. order Bixineæ.)

SCOLOPIA, *Schreb. Gen. Pl. p.* 127.—GEN. CHAR. Flowers hermathrodite, sepals 4-6 slightly imbricate when very young but open long before flowering, petals as many and nearly similar, stamens indefinite inserted on to the thickened torus with or without glands. Connective of the anthers terminating in a thick process; ovary with 3-4 placentas and few ovules. Style filiform, with an entire or lobed stigma; fruit a berry, seed 2-4 with a hard testa, cotyledons leafy. Trees, often armed with axillary spines, leaves simple with pinnate veins entire or toothed. Flowers small in axillary racemes. *Schreb. Gen.* 335. Phoberos, *Lour. Fl. Coch.* 317. Rhinanthera, *Bl. Bijdr.* 1121. Dasyanthera, *Presl. Rel. Hank.* ii. 90. *t.* 66.

SCOLOPIA CRENATA. (Wight.) A good sized tree, unarmed, leaves glabrous elliptic slightly attenuated at the base and gradually narrowed into an obtuse point at the apex, obtusely crenated, without glands at the base, 3-4 inches long by 1-1¼ broad, racemes pubescent as long or a little longer than the leaves from the superior axils, flowers nearly ½ an inch in diameter on longish peduncles which are furnished with 2-3 small bracts at the base, calyx and corol scarcely distinguishable pubescent and ciliated. placentas of the ovary 4, fruit 5 lines in diameter apiculate. Phoberos crenatus, *WA. Prod. p.* 29. Flacourtia crenata, *Wall l. n.* 6679. Phoberos lanceolatus, (Wight). *WA. Prod. p.* 30.

This tree is very common on the Shevaroys, Nilgiris, &c.; it is called Hitterloo by the Burghers on the Nilgiris; it is a first rate wood, and although white, is very hard and dense; it resists the saw and injures tools; planks are said to twist. The Phoberos lanceolatus of Wight has the leaves narrower and more shining but does not differ otherwise.



Mavis del. *Scolopia crenata (Wight)* Dumphey Lith.

BIXA ORELLANA. (Nat. order Bixineæ.)

BIXA. *Linn. Benth. & Hook. Gen. Pl.* 1. 125.—GEN. CHAR. Flowers hermathrodite, sepals 5 much imbricated deciduous, petals 5 large imbricate, stamens indefinite with short oblong somewhat tetragonous anthers dehiscing by 2 pore-like transverse slits at the top (really linear anthers folded back upon themselves dehiscing only in the middle of each lobe), ovary 1-celled with 2 or rarely 3 multiovulate placentas, style slender, stigma minutely 2 lobed, capsule coriaceous compressed ovoid or subcordate, rarely 3 gonous rough with long stiff bristles, separating into 2 or 3 valves, bearing the seeds covered with a red pulp.

BIXA ORELLANA. (Linn.) A small tree or shrub 10-15 feet, the young shoots and inflorescence rusty-puberulous, leaves alternate ovate or subcordate-ovate, acuminate or entire rarely with 1 or 2 unequal lateral lobes, palminerved at the base usually 4-6 inches long by 2½-3½ inches broad, glabrous or glabrescent; flowers white or rose colored 1½-2 inches in diameter in terminal panicles or panicled racemes, fruit 1½-2 inches long 1¼ inches broad, rather pointed. *DC. Prod.* 1. 259 ;—*Wight. Ill. tab.* 17.

This small tree, though of American origin, is quite naturalized in the Madras Presidency, particularly on the western coast. The red pulpy covering of the seed is used as a dye under the name of Arnotto; it is prepared by macerating the pod in boiling water, extracting the seeds, and leaving the pulp to subside, the fluid being subsequently thrown off, the residuum with which oil is often mixed is placed in shallow vessels and dried in the shade; it is of a bright yellow color and imparts an orange or pale rose color, to silk and cotton; the substance is worth 1s. the lb. in the London Market; it has medicinal qualities, being astringent and esteemed an antidote to dysentery. Cordage is made from the bark of the tree, and the wood is a good one for producing fire by friction.

Alvarez del. Dumphry Lith.

Bixa Orellana, (Linn.)

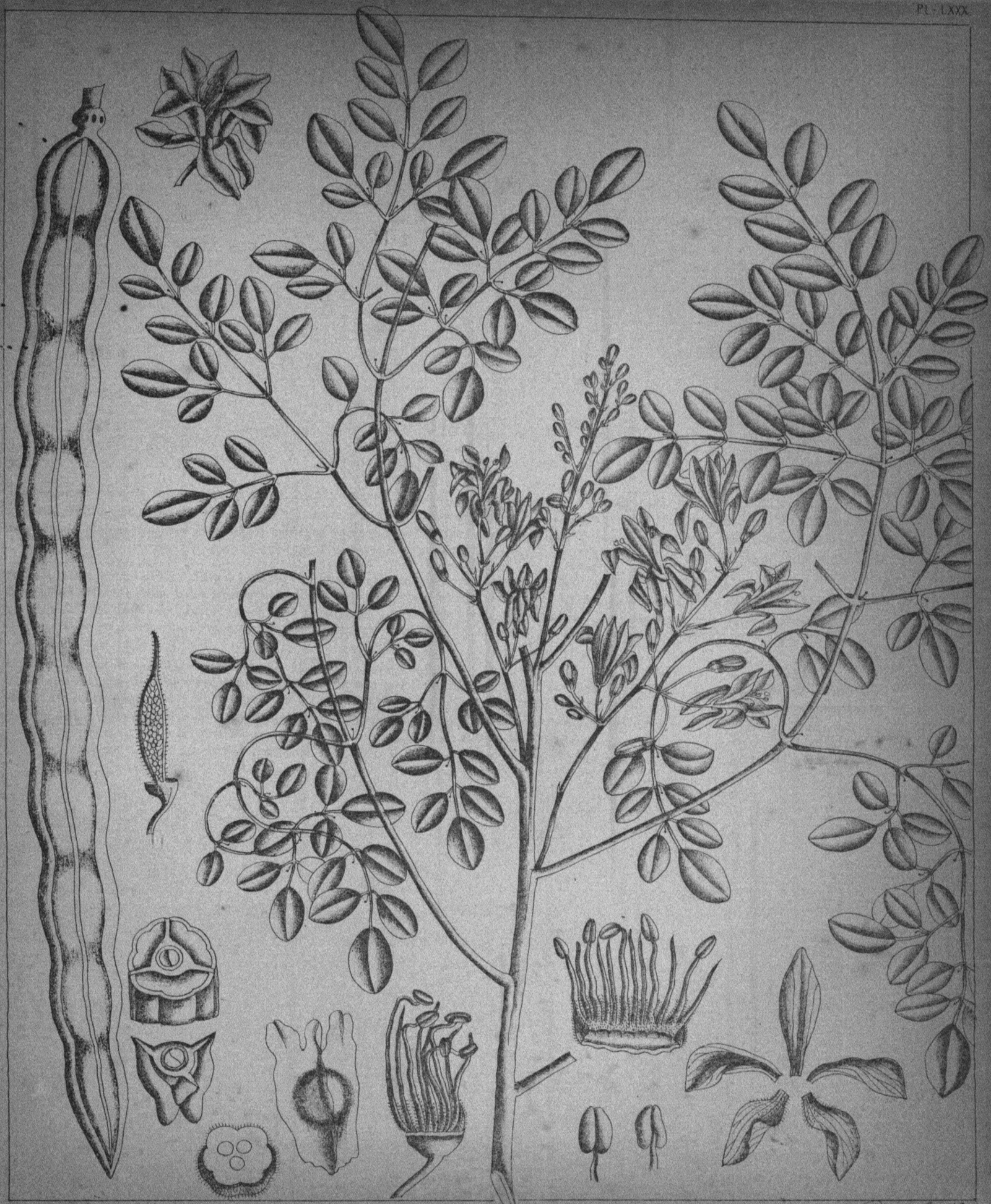
MORINGA PTERYGOSPERMA. (Nat. order Moringaceæ.)

MORINGA. *Juss.*—GEN. CHAR. Same as that of the order, for which see Manual.

MORINGA PTERYGOSPERMA. (Gærtn.) A small or middling sized tree, leaves twice or thrice pinnate, leaflets small oval, a stalked gland present on the petioles at the insertion of the pinnæ and the same at the insertion of the secondary pinnæ, and of the leaflets, flowers white or rarely reddish, 5 fertile stamens and 5-7 staminodia, capsules triquetrous seeds 3 angled, the angles expanding into wings. *Gærtn. fr.* 2 *p.* 314 *t.* 147;—*Rheed. Mal.* 6 *t.* 11 ;—*Wight Ill. tab.* 77.

This is the horse radish tree of India. It is very common about villages throughout India, and is quite wild in some jungles, the root furnishes the horse radish and the fruit is eaten in curries; the seeds yield a very pure sweet oil which is used as salad oil in the West Indies, and is also employed by watchmakers, as it does not freeze at a very low temperature. The tree is very easily raised from seed; its timber is very soft and useless, and not even fit for fuel; its twigs and leaves are good fodder. An oil exudes fom incisions in the trunk, which is used in rheumatism.

Mr. Dalzell describes, in his Bombay Flora, a second species under the name of M. Concanensis, *which he states is wild on the ghats in the Concan, and which only differs from this in having larger and rounder leaflets, and in the flowers being yellowish streaked with pink; it is probably only a variety of the tree here figured. A wild variety very abundant on the hills in North Arcot, particularly so in the Thelle jungles about* 16 *miles from Vellore, has also much larger and rounder leaflets than the ordinary cultivated form, and is probably Mr. Dalzell's tree, though I have not seen it in flower; the natives informed me that the fruit of this wild variety is never eaten, there were no traces of flower or fruit on any of these trees in the month of December, though all the cultivated ones at the same period were in flower.*



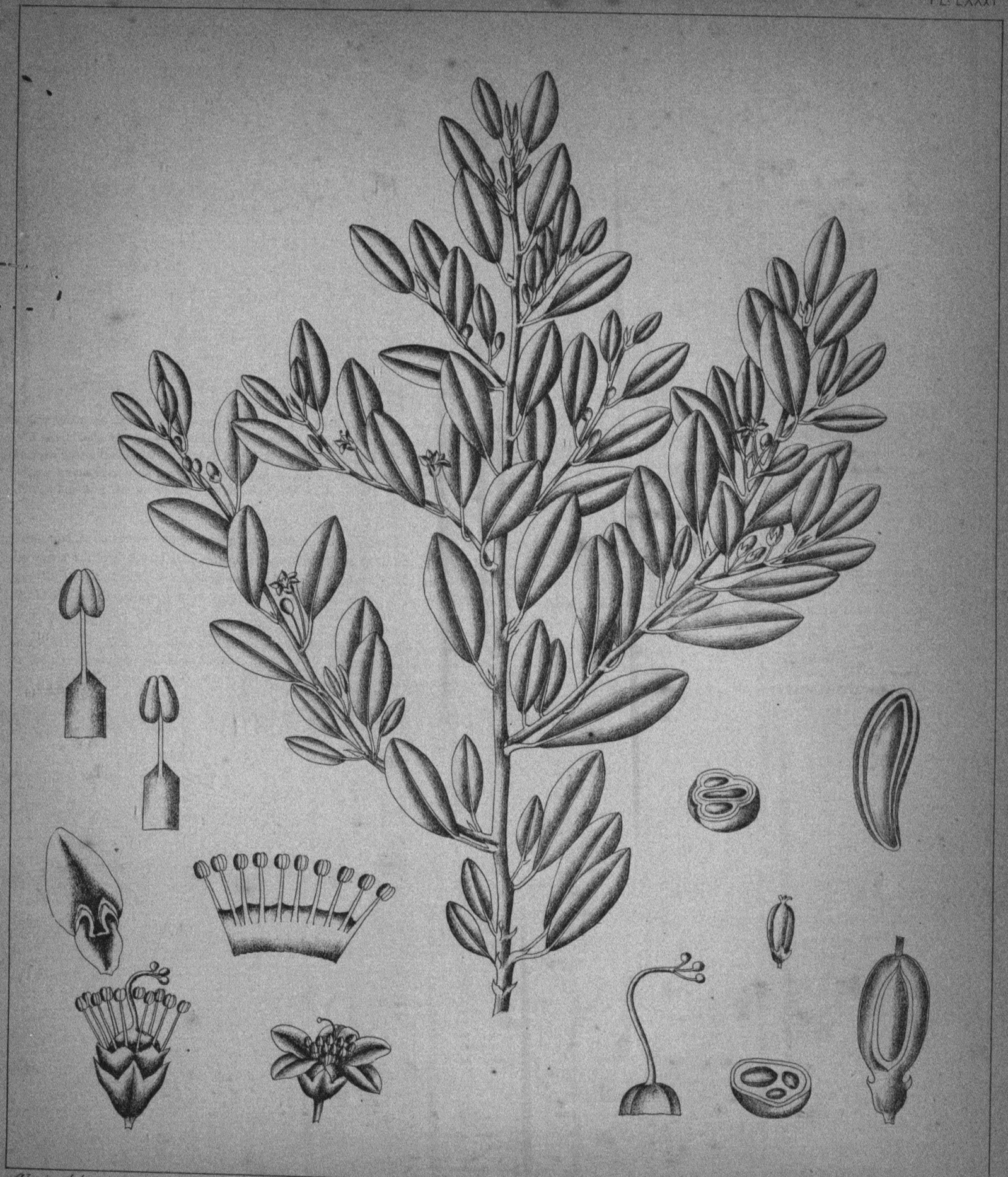
Govindoo, del. Moringa pterygospermia (Gærtn.) Dunsday, Sc.

ERYTHROXYLON INDICUM. (Nat. order Lineæ.)

ERYTHROXYLON. *Linn. Benth and Hook. Gen. Pl. p.* 283.—Sepals 5, rarely 6, united into a lobed calyx or free, petals as many with a 2 lobed appendage inside below the lamina. Stamens 10, rarely 12, the basal tube short without glands, or more or less thickened into 10 glands, the filaments attached inside just below the crenulate top, ovary 3 rarely 4 celled with 1 or rarely 2 ovules in each cell, drupe usually 1 seeded, albumen copious or thin or none, styles 3 rarely 4 free, or more or less connate. Trees or shrubs, leaves entire, stipules united into 1 with the petiole deciduous or persistent, especially on the leafless base of the young shoots, flowers small whitish, solitary or clustered in the axils of the leaves or of leafless stipules. *L. Gen. n.* 575. Steudelia, *Spreng.* Sethia, *Kunth.*

ERYTHROXYLON INDICUM. (DC.) A small tree, leaves alternate obovate or oblong obtuse cuneate at the base, feather nerved reticulated with veins, under side pale, 1-1½ inches long, by about ½ an inch broad, pedicels axillary 1-3 about twice as long as the petiole, 1 flowered, calyx 5 lobed, styles 3 combined nearly to the apex longer than the stamens, stigmas clavate, drupe oblong triangular 3 celled, 2 of the cells small abortive. Sethia Indica, *DC. Prod.* 1 *p.* 576. Erythroxylon, monogynum, *Roxb. Fl. Ind.* 2 *p.* 449.

This small tree is common throughout the Madras Presidency; the timber is flesh colored and excellent, but of small size; the tree is known as the bastard Sandal, and is called Devadaru in Tamil, the wood is used as a substitute for Sandal-wood, and an empyreumatic oil or wood-tar, of a reddish brown color, is procured from it, which is used for preserving the wood employed in the construction of native boats.



Alves, del.

Erythroxylon Indicum, (D.C.)

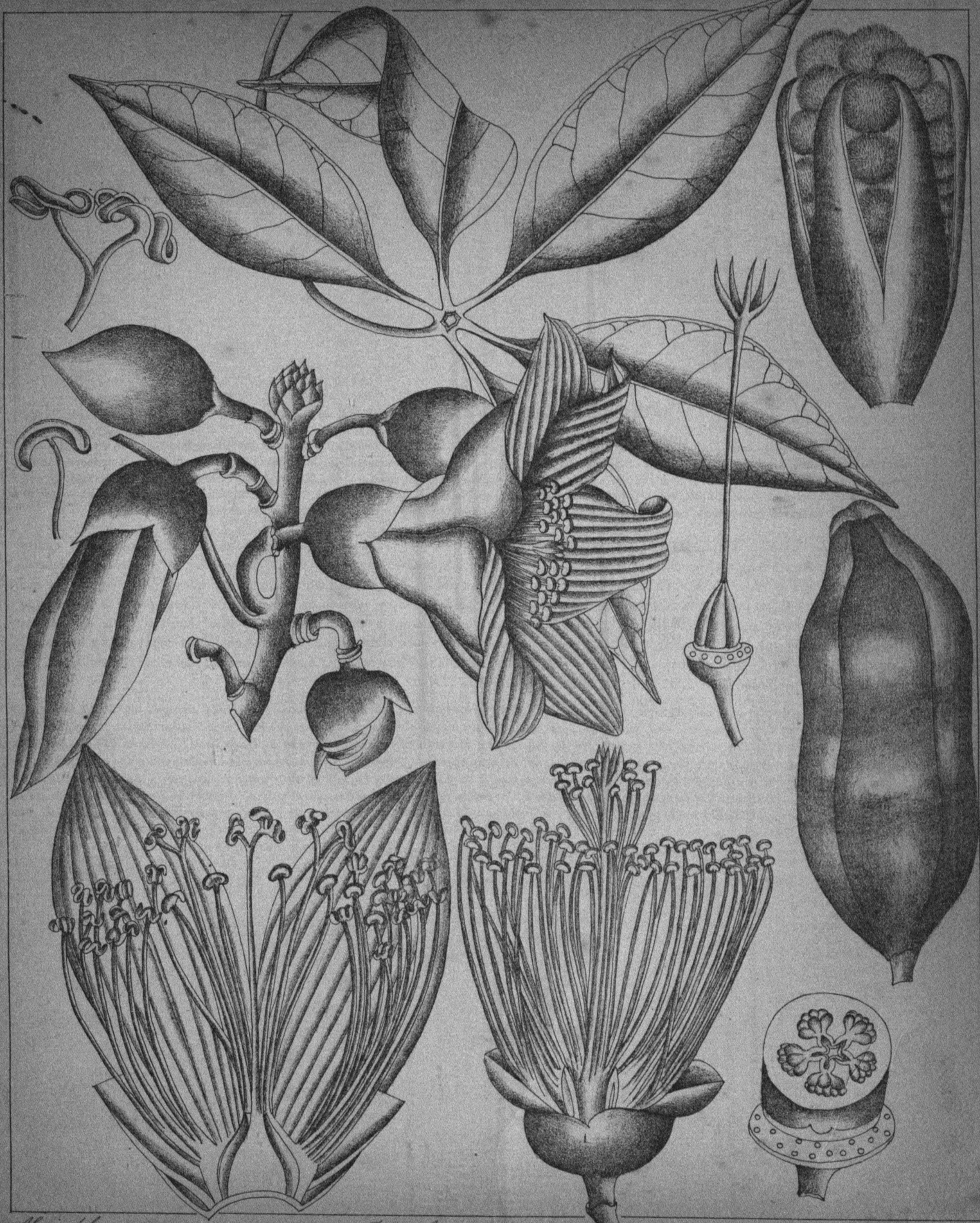
Dumphey, Lith.

BOMBAX MALABARICUM. (Nat. order Malvaceæ.)

BOMBAX. *Linn. Benth and Hook. Gen. Pl. p.* 210.—GEN. CHAR. Calyx cup-shaped truncate or splitting into 3-4 lobes, staminal column divided into numerous filaments of which the inner ones or nearly all are more or less connected in pairs and united at the base into 5 or more bundles, ovary 5 celled with several ovules in each cell, style club-shaped or shortly 5 lobed at the top. Capsule woody or coriaceous, opening loculicidally in 5 valves, the cells densely woolly inside, seeds obovoid or globular enveloped in the wool of the pericarp, albumen thin, cotyledons much folded round the radicle. Trees, leaves digitate with leaflets usually entire, peduncles 1 flowered axillary or terminal, flowers white or red. Salmalia, *Schott.*

BOMBAX MALABARICUM. (DC.) A gigantic tree, the trunk at least when young covered with short conical prickles, leaves on long petioles deciduous, leaflets 5-7 petiolulate, elliptical-oblong acuminate 4-6 inches long coriaceous entire glabrous, flowers large red or white on short peduncles clustered towards the end of the branches, which are then destitute of leaves, calyx 1 inch long and more, thick coriaceous glabrous outside, silky-hairy inside dividing into short broad obtuse lobes, petals 3 inches long, oblong tomentose outside, subglabrous within, staminal column short, filaments much longer, but shorter than the petals, 5 innermost forked at the top each branch bearing an anther, about 10 intermediate ones simple, and the numerous outer ones shortly united in 5 clusters, capsule large oblong and woody. *DC. Prod.* 1. 479. Salmalia Malabarica, *Schott Meletem* 35. Bombax heptaphylla, *Cav. Wight Ill. t.* 29;—*Roxb. Fl. Ind.* iii. *p.* 167. Moul elavao, *Rheede Mal.* iii. *p.* 61. *t.* 52.

This gigantic tree is a very conspicuous and beautiful object in all our forests; its trunk is beautifully straight and often 80 *or* 100 *feet to the first bough, of great girth, and generally furnished with very large buttresses. The flowers are very large and handsome, but appear when the tree is destitute of leaves; it is called the cotton tree by Europeans, Simal in Hindustani, Boorgha in Teligu, and Illavam in Tamil; the timber is generally considered quite worthless in this Presidency, but in some parts of the western coast, trunks are hollowed out to make river canoes, the wood is whitish, coarse grained, weak and brittle, soon decays, and is very subject to the attack of white ants; in some parts the timber is used for boxes, planks, &c., and it is said to be rendered more durable by the action of water, and is consequently used for water conduits, well curbs, &c., and sword scabbards are occasionally made of it. The cotton is used to stuff pillows, &c., but is useless for textile purposes; the gum from the bark and the root are in use medicinally amongst the natives. It is found throughout India, and in Birmah and Ceylon; in the latter place it is called Katu imbal, and is in use for toys, models, floats, &c.; it makes a very poor fuel. The white flowering variety is much rarer than the red.*



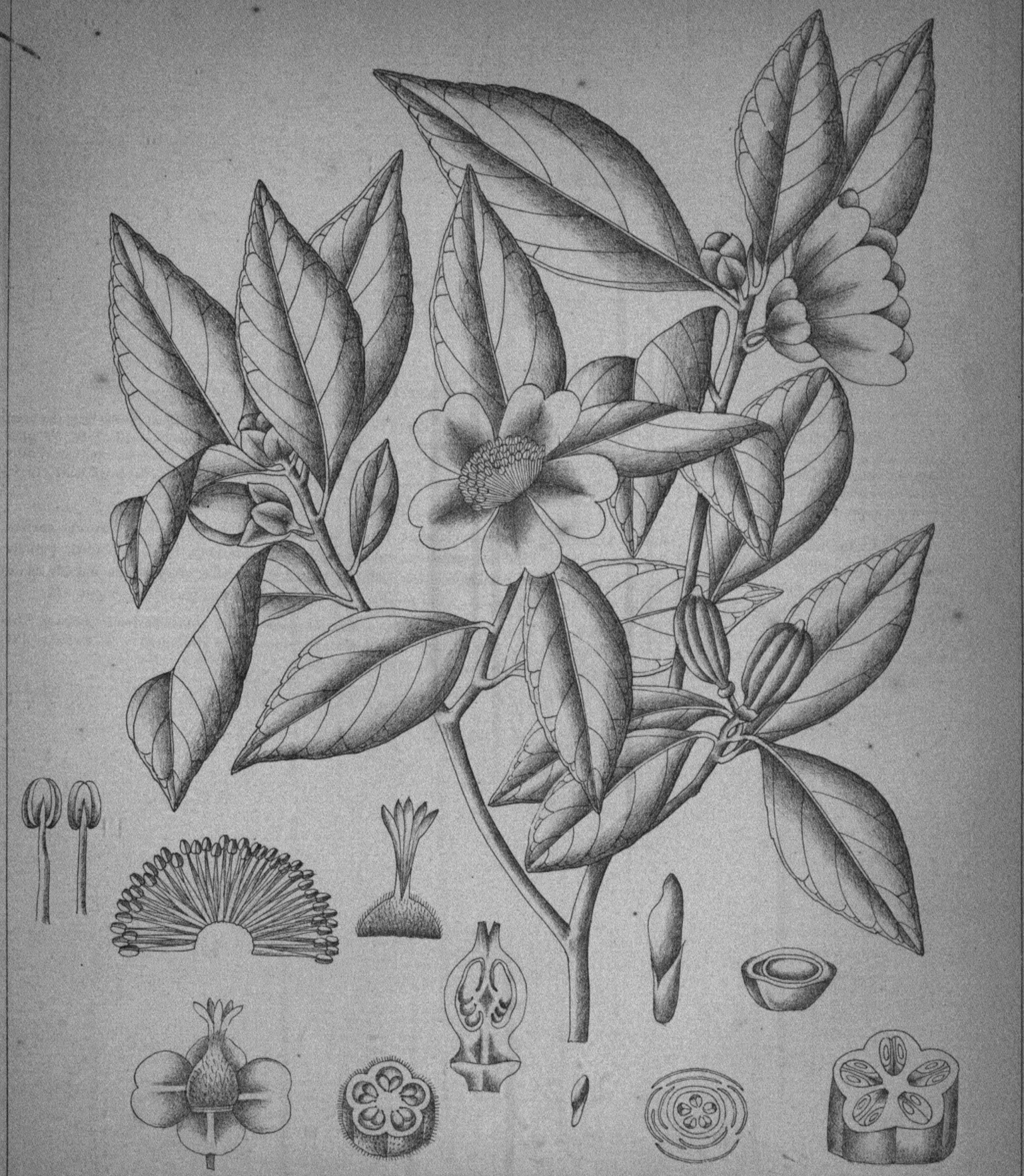
Stuart, del. *Bombax Malabaricum* (D.C.) Dumphey, Lith.

GORDONIA OBTUSA (Nat. order Ternstrœmiaceæ.)

GORDONIA, *Linn. Benth. and Hook. Gen. Pl.* 1 *p.* 186.—GEN. CHAR. Sepals about 5, much imbricated very unequal passing from the bract to the petals, petals about as many, the innermost, the largest, all usually cohering at the base, stamens numerous, anthers short, versatile, ovary 3-5 celled (rarely 6,) with several (4-8) pendulous ovules in each cell, capsule woody oblong opening loculicidally, the valves bearing the dissepiments, but usually leaving a free central axis; seeds flattish oblique, expanded at the top into an oblong wing, albumen 0 embryo nearly straight with flat cotyledons. Trees, leaves coriaceous, peduncles 1 flowered erect or recurved, flowers showy.

GORDONIA OBTUSA. (Wall.) A middling sized tree, glabrous, leaves cuneate-oblong to elliptic-lanceolate or narrow lanceolate, obtuse or with a blunt acumination with shallow serratures glabrous 2½-5 inches long, by 1-1¼ broad, petioles about 2 lines long, peduncles a little shorter than the petioles, petals obcordate, slightly united at the base, silky on the outside as are the bracts and calyx, stamens somewhat pentadelphous. *Wall. L. n.* 1459;—*WA. Prod. p.* 87. Gordonia parviflora, *Wight. Ill.*

This very beautiful tree is very common on the Nilgiris, the Wynad, and throughout the western ghats of the Madras Presidency, from 2,500 *feet to* 7,500. *On the Nilgiris it is called Nagetta; its timber is white, with a straw tint, even grained and pleasant to work, and not unlike Beech; it is very generally in use for planks, doors, rafters, and beams, but warps if not well seasoned.*



Govindoo del.

Gordonia obtusa (Wall.)

Dumphy Lith.

VATERIA MALABARICA. (Nat. order Dipterocarpeæ.)

VATERIA. *Linn. Benth. and Hook. Gen. Pl. p.* 193.—GEN. CHAR. Calyx with a very short tube adnate to the torus, divisions sub-equal imbricate, when in fruit reflexed and scarcely increasing in size, stamens numerous, in many series, anthers linear or oblong, ending in a long single or double beak, ovary 3 celled, cells 2 ovuled, style subulate, stigma small, capsule ovoid or globose, thick coriaceous or fleshy, seated on the reflexed calyx, 1 seeded indehiscent or 3 valved; seed thick, cotyledons thick unequal, radicle superior.

Trees, yielding resin, glabrous or furfuraceous, stipules small deciduous or inconspicuous, leaves entire coriaceous, flowers white in terminal panicles. Bentham and Hooker unite Mr. Thwaites' Ceylon genus Stemonoporus with Vateria; it has 15 anthers in 2 series, and if united with Vateria, Monoporandra, with 5 anthers in 1 series, should also be included. De Candolle includes Stemonoporus under Vatica, which has an enlarged calyx when in fruit.

VATERIA MALABARICA. (Bl.) A very large tree, bark whitish, young shoots and all tender parts except the leaves covered with fine stellate pubescence, leaves alternate petioled oblong entire, slightly cordate at the base, shortly pointed or obtuse at the apex, coriaceous and smooth 4-8 inches long, by 2-4 broad, petioles 1 inch long, stipules oblong, flowers rather remote on large terminal panicles, bractes ovate pointed, filaments 40-50 very short, anthers not auricled at the base, terminating in a single long bristle at the apex, style a little longer than the stamens, stigma acute, capsule oblong obtuse coriaceous fleshy, 2-2½ inches long by 1½ broad, seed solitary. *Bl. Mus. Bot.* ii. *p.* 29. Vateria Indica, *Roxb. Fl. Ind.* ii. 602. (not *Linn.*) Chloroxylon Dupada, *Buchanan Journal in Mysore, &c.*, ii. 476. Paenoe, *Rheed. Hort. Mal.* iv. 33. 15.

This tree has often been confounded with the Ceylon Vateria Indica, though it was well described by Roxburgh; it differs in its leaves and fruit being very much smaller, and in the former being obtuse or scarcely acute, never acuminate, and in its anthers terminating in a single instead of in a double bristle and in not being auricled at the base.

This is one of the handsomest trees in the Madras Presidency; it is common in all the western forests from the plains up to 3000—4000 feet elevation, and is extensively planted as an avenue tree, particularly near the coast in South Canara, Malabar and Travancore; the avenue of it at Karkal in S. Canara, is a beautiful sight. It is called in English the Piney Varnish tree, the copal tree, and the white dammer tree, in Telugu Dupada, in Tamil Vellay Kungilium, and in Canarese Dupaini. It yields the piney gum resin which exudes copiously from wounds in the trunk, and is an excellent varnish resembling copal, and of a pale green color, and is used for carriages and furniture; the wood is not much esteemed, but is used for coffins and masts of native vessels, and trunks of the tree are hollowed out to make canoes for the western coast rivers; the bark is used to keep toddy from fermenting. The tree flowers in January. Mr. Broughton the Government Quinologist has furnished me with the following report on the resin.

RESIN OF VATERIA INDICA, *White dammer or piney resin.—This beautiful substance has long been known, and its properties and local uses have been repeatedly described. It is also not unknown in England, and I apprehend that its cost (and perhaps also ignorance of its peculiar properties) has prevented it becoming an article of more extended commerce. It should be remarked that the "East Indian dammer" which is well known among varnish makers, though frequently confounded with this, is the product of a very different tree, and is not produced in this Presidency. The finest specimens of piney resin are obtained by making incisions in the tree, and are in pale green translucent pieces of considerable size. The resin that exudes naturally, usually contains much impurity. In most of its properties it resembles copal, but it possesses qualities which give it some advantages over the latter. Like copal it is but slightly soluble in alcohol, but as Berzelius pointed out in the case of copals, it can be brought into solution by the addition of camphor to the spirit. It is easily soluble in chloroform, and thus might find a small application as a substitute for amber in photographer's varnish; it differs most advantageously from copal by being at once soluble in turpentine, and drying also without the necessity of the preliminary destructive fusion required by the resin, a process which tends greatly to impair the color of the varnish. The solution of the piney resin in turpentine is turbid and milky, but by the addition of powdered charcoal, and subsequently filtering, it yields a solution transparent and colorless as water, and yields a varnish which dries with a purity and whiteness not to be surpassed. The solution in turpentine readily mixes with the drying oils. It is on these properties of the resin that its chance of becoming an article of trade will depend. In price it cannot compete with copal when supply to the European market is regular and abundant. The present price of the best copal in the English market is but £2-10-0 per cent.; piney resin yields on destructive distillation 82 per cent. of an oil of agreeable odour, but not differing essentially from that obtained from much cheaper resins.*

Vaterea Indica L.

Govindoo, del.

Vaterea Malabarica Wl.

Dempsey Lith.

ORDER X.—POLYGALEÆ.

Flowers irregular hermathrodite, sepals 5, free or 2 anterior connate, 2 inner larger petaloid wing-like, rarely subequal, petals 3 or 5 declinate free from each other but usually adherent to the staminal sheath, lower petal concave or helmet-shaped; stamens 8 rarely 5, 6 or 4 free or monadelphous, the sheath open above and usually adnate to the base of the petals; anthers 1-2 celled opening by a transverse valve or terminal pore, torus small or expanded with an annular disk, ovary 2-or by abortion 1-celled, rarely 3 celled, style simple often incurved, filiform or variously dilated above; stigma lobed, fruit a compressed 2-celled capsule, dehiscing loculicidally by the margins, baccate and 1-3 celled, or samaroid; seeds pendulous, frequently strophiolate, testa often pilose, embryo axile with flattened cotyledons and a short superior radicle with or without a fleshy albumen. Small trees, shrubs (or herbs), stipules none, leaves alternate rarely opposite simple entire, flowers solitary, spicate, or racemed or rarely panicled.

An order of no importance to the forester The genus Xanthophyllum is represented by small trees in the peninsula; the genera Polygala and Salomonia yield only herbs or under shrubs.

XANTHOPHYLLUM. Roxb.

Sepals slightly unequal the 2 interior slightly larger, petals 5 free declinate, 4 subequal glabrous, the fifth (or the carina) cymbiform entire pubescent. Stamens 8, all free, or the 2 lower united with the claw of the carina, two distinct inserted opposite to the inner petals, the others attached one to each of the claws of the upper and lateral petals, anthers 2 celled erect opening by a pore, disk hypogynous annulate, ovary 1 celled or imperfectly 2 celled, ovules 2-6 variously inserted, style incurved, fruit globose between coriaceous and fleshy indehiscent 1 seeded, seed subglobose, without a caruncular, exalbuminous, cotyledons thick and fleshy (or albuminous, cotyledons subfoliaceous) radicle short small. Trees or shrubs glabrous; leaves alternate coriaceous, racemes axillary, supra axillary, or terminal. *Roxb. Fl. Corom.* iii. *t.* 24. Jackia, *Bl. Bijdr. (non Wall.)*

1. Xanthophyllum Arnottianum, *Wight.*—A small tree, leaves elliptic oblong with a short blunt acumination 3 to 4½ inches long by 1-1¾ broad, furnished with 2 concave pore-like glands near the base and several scattered over the under surface, racemes axillary and terminal puberulous 2-4 inches long often panicled, ovules 8-12 attached by pairs to two lateral placentæ, fruit globose 1 seeded. *Wight Ill. p.* 50. X. flavescens, *WA. Prod. p.* 39. (*not Roxb.*)

Western slopes of the Nilgiris, Malabar, &c.

2. X. angustifolium, *Wight.*—A small tree, leaves narrow lanceolate elliptic obtuse or acuminated glabrous, racemes axillary and terminal shorter than the leaves, ovary 1 celled 4 ovuled, two ascending from the base and two pendulous from the apex of the cell. *Wight Ill. p.* 50, *tab.* 23. X. undulatum, *Wight l. c. p.* 50. X. Roxburghianum, *Wight l. c. p.* 50.

Courtallum, Bolumpatty valley (Coimbatore.)

X. virens, *Roxb.*—A small tree, leaves elliptic oblong with a longish acumination often undulate on the margin, shining above, about 4 inches long by 1¼-1½ broad, glandular pores more or less over the whole under surface, but also often present at the base near the insertion of the petiole, petioles 2-3 lines long, racemes puberulous solitary or twin in the axils and terminal, shorter than the leaves, ovules 4, one pair attached to the walls of the cavity on each side some way above the base. *Roxb. Fl. Ind.* ii. *p.* 221. X. flavescens, *Wight Ill. p* 50 (*not Roxb.*)

Paupanassum Hills, 2—3,000 feet. Ceylon. Roxburgh mentions that it grows to a large tree in Sylhet, but it appears always to be small in Southern India. Wight figures the ovules wrong (as erect from the base); in all the flowers that I have dissected of Ceylon and Tinnevelly specimens, they are attached to the sides of the walls of the cavity some way above the base.

I know nothing of the timber or other uses of these three trees, but the former is too small to be of any use; they are all closely allied and scarcely distinguishable except by the position and number of their ovules.

Analysis. Pl. III. *fig.* 2.

1. Flowers and ovary of X. angustifolium.
2. Ovary of X. Arnottianum.
3. Ovary of X. virens.

ORDER XI.—TAMARISCINEÆ.

Flowers regular generally hermathrodite, sepals 5 rarely 4 or 6 free or connate at the base, imbricate, petals as many inserted under the disk, imbricate, free or joined into a tube at the base, disk hypogynous or slightly perigynous 10-glandulous, crenate or angulate rarely obsolete, stamens 5-many inserted on to the disk free or variously connate at the base, anthers 2-celled versatile generally apiculate, cell dehiscing longitudinally, ovary free 1 celled or imperfectly partitioned, styles 3 5 stigmatose at the apex, free or connate, or as many stigmas sessile, placentas as many as the styles, only at the base of the cavity or reaching to the apex, ovules 2-many erect from the base anatropal, capsule dehiscent, seeds with a sessile or stipitate crest of long hairs, or without a crest and covered with long hairs or winged, albumen none, or (in extra Indian genera) subfleshy or very thin, embryo straight, cotyledons plane, radicle inferior short. Small trees or shrubs, leaves alternate small squamiform, stipules none.

A small order of no importance.

TAMARIX. LINN.

Sepals 4-5 rarely 6 free, petals as many inserted under the disk free or slightly connate at the base, stamens 5-10 rarely 4 or 11-12 inserted on to the disk free or scarcely joined into a ring at the base, ovary attenuated at the apex, styles 3-4 rarely 2 or 5 short thick, placentas short at the bottom of the cavity of the ovary, many ovuled. Seeds many small glabrous with a straight beak, feathered with long spreading hairs, or not beaked but with a simple pappus-like coma at the apex, albumen none, embryo conforming to the seed, ovoid-oblong. Small trees or shrubs. leaves amplexicaul or sheathing, flowers white or rose, spicate or densely racemose *Linn. Gen. n.* 375. Trichaurus, *Arnt. WA. Prod. p.* 40.

1. TAMARIX ERICOIDES, *Rottl*—A shrub or small tree, young leaves sheathing, spikes terminal, bracts equalling the pedicel flowers large, rose colored, stamens 10, the alternate ones shorter inserted between and alternating with the teeth of the torus, filaments distinct not connected by a membrane, seeds rostrate, break straight feathered with long spreading hairs. *Rottl. and Willd.* Trichaurus ericoides, *WA. Prod. p.* 40. Myricaria vaginata, *DC. Prod.* III *p.* 98.

A beautiful shrub or small tree found in beds of rivers in the Madras Presidency, Bombay and Ceylon; it has rather large heath-like flowers and is cultivated in gardens.

2. TAMARIX GALLICA, *Linn.*—A small tree, trunk sometimes up to 3 feet in circumference, 6-12 feet high crooked bark scabrous, branches numerous erect or somewhat pendulous, their bark greenish, leaves minute pressing close to the branchlets subulate acute from a triangular amplexicaul base rarely over 2 lines long. flowers very numerous crowded in slender lateral and terminal spicate racemes forming large beautifully drooping paniculate masses of flower, pedicels equalling or shorter than the calyx from a scale like bract, sepals ovate deltoid entire or minutely denticulate, much shorter than the free petals, stamens 5 equal twice as long as the petals, styles 3 articulated at the division lobes at length divergent. *DC. Prod.* III. 96 Tamarix Indica, *Roxb. Fl. Ind.* II. *p.* 100. (excl. syn. Vahl) *Wight Ill* I. *t* 24

Found in sandy beds of rivers and near the sea coast in the Madras Presidency, Bengal and Ceylon, it is very ornamental and is cultivated in gardens; in Bengal it is called Jhau, and is largely used for Railway and Steamer fuel, the wood is reddish and coarse grained and in use for several purposes.

3. TAMARIX DIOICA, *Roxb.*—A small tree, diœcious, trunk short, bark dark colored cracked, branches very numerous spreading and drooping, leaves tubular sheathing obliquely truncated pointed smooth more like joints of the bark than leaves, spikes terminal simple cylindric often drooping numerous and forming beautiful drooping masses, flowers diœcious, very numerous sessile small rose colored inodorous, bracts triangular acute 1 flowered, stamens 5. Male flowers with a small 3 lobed rudiment of an ovary; female flowers with saggitate sterile anthers, ovary 3 lobed, styles 3 longer than the corol stigmas clavate recurved. *Roxb. Fl. Ind.* II. *p.* 101.

In the beds of rivers in the Madras Presidency and Bengal, and introduced into gardens; it is highly ornamental and in flower almost all the year, in Bengal it is called Lal Jháo.

4. TAMARIX ARTICULATA, *Vahl*, with articulated branchlets, leaves reduced to a sheath and oblique point, and with interrupted racemes, is a small tree found in Bengal.

Analysis of Genera, Pl. III, *fig.* 1.

Dissections of the flower of Tamarix ericoides.

ORDER XII.—GUTTIFERÆ.

Flowers regular, diœcious, polygamous or hermathrodite, sepals 2-6 imbricate or in decussate pairs, petals 2-6 rarely more, usually much imbricated or contorted Male flower stamens usually indefinite, hypogynous, filaments free or variously connate, monadelphous or in as many phalanges as petals, anthers various. Female flower staminodia various, ovary 1-2 many celled, ovules 1-2 or many axile, or erect from the base of the cavity (rarely parietal in one extra-Indian genus) stigmas as many as the cells of the ovary or variously consolidated, sometimes peltate entire, sessile, subsessile, or with more or less elongate style, fruit an indehiscent berry or drupe with a fleshy or pulpy pericarp, or a capsule opening in as many valves as cells. Seeds large exalbuminous often arillate. Embryo of a large radicle with small or obsolete cotyledons, or of thick fleshy cotyledons and very short inferior radicle. Trees often abounding with yellowish or green juice, leaves opposite rarely verticelledate thickly coriaceous entire.

A most important order containing the valuable poon spar (Calophyllum elatum) and other species of that genus; the different species of Mesua which yield the Iron wood of Ceylon and Southern India, and the Gamboge trees, (Garcinias).—The mangosteen belongs to the order.

Tribe 1. *Garcinieæ.*—Embryo consisting of a large fleshy radicle with small or obsolete cotyledons.

Garcinia, Xanthochymus, Ochrocarpus.

Tribe II, Calophylleæ.—Embryo consisting of thick fleshy cotyledons and very short inferior radicle.

Calophyllum, Kayea, Mesua.

GARCINIA. LAM.

For Gen. Char, see letter press of the plate of G. Cambogia, Pl. lxxxv.

1. GARCINIA PURPUREA, *Roxb.*—A tall slender tree with drooping branches, leaves dark green, red when young obovate lanceolate acuminate. Male flowers longish pedicelled aggregated 4 8 congested in the terminal axils 2-4 in the lateral ones, column of stamens short capitate filaments free for a short distance at the apex, anthers few (12-20) occasionally one or two in the centre simulating a rudimentary, ovary oblong 2 celled dehiscing longitudinally, fruit globose not furrowed 4-8 seeded deep purple.

This tree is found in the Wynad and Coorg and on the Bombay ghats, the fruit is eaten, and has an agreeable acid flavour; a syrup is also made from it, and the seeds furnish a concrete oil called Kokum in the Bombay Presidency.

2. GARCINIA, *Sp.*—A small tree, leaves subspathulate very obtuse, dark green above paler beneath, 3-4 inches long by ¾ to 1 inch broad; petioles nearly 1 inch long, primary veins very straight at nearly right angles with the mid rib, veinlets forming a regular net work of small paralellogram shaped areoles; flowers subsessile in the terminal axils, fruit (young) narrow oblong crowned with the very large rough peltate stigma which has a repand margin.

I have only found this tree on the Calcad Hills close to the coffee estates at an elevation of about 3,000 feet; I only procured it in young fruit; a yellow pigment exudes from every portion of the tree; it probably belongs to the section Peltostigma.

3. GARCINIA MORELLA, *Desrous.*—For description, &c., see Plate lxxxvi.

4. GARCINIA PICTORIA, *Roxb.*—For description, &c., see Plate lxxxvii.

5. GARCINIA CONICARPA. *Wight.*—Leaves subspathulate very obtuse longish petioled, flowers subsessile in the terminal axils, fruit conical 4 seeded, 4 furrowed, furrows angular. *Wight Icones, tab.* 121.

Sivagherry mountains. I do not know this tree unless it is a form of G. Cambogia; the shape of the leaves is much like my No. 3, but the apex of the fruit is quite different.

6. GARCINIA ECHINOCARPA, *Thw.*—A good sized tree, 40-50 feet, diœcious, leaves coriaceous, oblong or lanceolate acuminate, 2½-5 inches long, 1½-3 broad, petioles 5-8 lines long sulcate above, flowers terminal sessile pale yellow, sepals thick concave petals oblong. Male, numerous aggregated, female solitary, male stamens with the filaments joined below on to a 4-sided androphore, or disk, above free, anthers subquadrate reddish, female, sterile stamens joined into one series at the base, free above, ovary covered with numerous imbricated fleshy scales, stigma subsessile peltate irregularly lobed, lobes tuberculate, fruit subspherical, echinately muricate, 1-3 seeded, 1-1½ inches long, seeds oblong, testa coriaceous reddish brown. *Thw. Hook. Journ. of Bot., Vol. VI, p.* 71;—*En. Pl. Zey. p.* 49.

Vary. β.—Leaves very coriaceous obovate or oblong retuse or with an obtuse short acumination.

Ceylon, in the forests between Galle and Ratnapoora, at no great elevation. Variety *β.* in the Central Provinces at 4,000—6,000 feet elevation. A thick oil is extracted from the seeds, which the Cingalese burn in their lamps, but it gives an indifferent light; the tree is called Madol. This species is well distinguished by the scales on the ovary, which subsequently become the echinulations of the ripe fruit.

7. GARCINIA TERPNOPHYLLA, *Thw.*—A middling sized tree, diœcious, leaves lanceolate, narrowed at both ends sometimes with a longish obtuse acumination penniveined 3-4 inches long by 1-1¼ broad, red when young, petioles 4 lines long, flowers axillary fascicled or subumbellate 3½ lines long yellowish, male stamens numerous congested on to a 2 or 4 lobed disk, anthers 2-3-4 (generally 2) on each lobe, cells horizontal subimmersed, a small rudiment of an ovary, female, sterile stamens about 18 squamiform encircling the base of the ovary; ovary 2 celled, stigma peltate sublobate, fruit fleshy by abortion 1-celled 1-seeded, seed fixed by the middle, testa membranaceous. *Thw. En. Pl. Zey. p.* 406. Terpnophyllum Zeylanicum, *Thw l. c. p.* 49. Discostigma Zeylanica et acuminata, *Pl. et Tr. in Ann. Sc. Nat. series* iv. *t.* 14, *p.* 364;—*Walper's Ann. t.* vii. *fasc.* iii. *p* 353.

Vary. *α. lanceolatum*, leaves lanceolate stamen disk 2 lobed, lobes bifid sulcate in the middle.

Vary. *β. acuminatum*, leaves lanceolate with a long obtuse acumination, stamen disk 4 lobed.

Ceylon. Variety *α* is found in the Central Provinces at an elevation of 2,000—4,000 feet. Variety *β* in the forests between Galle and Ratnapoora, at no great elevation; they are very beautiful trees, with the young foliage of bright red color. The timber weighs 58-60 lbs. the cubic foot when seasoned, it is well adapted for bridge building and large framing, it is easily worked, but apt to split, so unfit for joiner's work.

I have united the G. papilla of Wight with the common G. Cambogia, (vide letter press to plates) as I cannot distinguish them, and I strongly suspect conicarpa is also only a form of that species; if otherwise, it is strange that I have not met with it.

XANTHOCHYMUS. ROXB.

For Gen. Char. see letter press to plate of X. pictorius, Pl. lxxxviii.

1. XANTHOCHYMUS PICTORIUS, *Roxb.*—For description, &c., see Plate lxxxviii.

2. XANTHOCHYMUS OVALIFOLIUS, *Roxb.*—A middling sized tree, leaves shining ovate or almost rotundate, with the apex rounded or retuse to lanceolate more or less acuminate 3½-5½ inches long by 1¾ to 2½ broad, petioles ¼ to ½ inch long, flowers lateral fascicled male and bisexual mixed, anthers about 6 8 to each bundle, ovary 3 celled, fruit oval size of a walnut with a smooth green rind and full of yellow juice, 1-3 seeded. *Roxb. Fl. Ind.* ii. *p.* 632;—*WA. Prod. p.* 102. ?X. spicatus, *WA. l. c.* Stalagmitis ovalifolius, *G. Don.*

Bombay. Canara, Malabar, and Travancore ghat forests, and in Ceylon, a tenacious gummy matter exudes from the trunk, but it is of no value. The tree is called Ellagokatee in Ceylon, it is a very elegant, straight, uncommonly ramous tree, and has been cultivated in the Botanical Gardens in Calcutta, where the trees began to blossom abundantly in the hot season, when from 7 to 10 years old, and produced ripe fruit at 10 years.

OCHROCARPUS. THOUARS.

For Gen. Char. see letter press to plate of O. longifolius, Pl. lxxxix.

1. O. LONGIFOLIUS, *Benth.* and *Hook.*—For description, &c, see Plate lxxxix.

CALOPHYLLUM. LINN.

For Gen. Char. see letter press to plate of C. elatum (Plate 2.)

Sepals 4, *Petals* 8.

1. CALOPHYLLUM WALKERI, *Wight.*—A large tree, branches terete, leaves nearly round or obcordate, very thick and coriaceous, racemes axillary congested on the ends of the branches, the extreme ones (from the abortion of the leaves) forming a terminal panicle, exterior pair of sepals much smaller than the interior, inner row of petals smaller than the outer, fruit spherical, about the size of a pretty large cherry, pericarp very thick and coriaceous.— *Wight Ill p.* 128.

Ceylon, most elevated parts of the island ; a very handsome tree. An oil is extracted from the seeds of this and of all the other species, which is used for burning.

2 CALOPHYLLUM CUNEIFOLIUM. *Thw.*—A large tree, branchlets glabrous, leaves small coriaceous cuneato-spathulate obtusely acuminate or retuse, 1¼ 1¾ inches long, 5 9 lines broad, petiole 3-4 lines long, flowers of middling size, sepals 4, petals 8 (or occasionally only 4 ?), fruit spherical 8 lines in diameter. *Thw. En. Pl. Zeyl p.* 51 *and* 407.

Ceylon, 3,000 to 4,000 feet elevation.

Sepals 4, *Petals* 4.

3. CALOPHYLLUM THWAITESII, *Pl. et Tr.*—A good sized tree, leaves from obovate-oblong rounded at the base, to cordate orbicular, racemes axillary and from the scars of the fallen leaves few flowered, sepals 4, petals 4, stamens very short, fruit spherical, *Planch. et Triana. in Ann. des Scien. Nat. ser.* 4, xv. p. 260 ;—*Thw. En. Pl. Zey. p.* 407. C. decipiens, *Thw. En. Pl. Zey* 51, *(excl. syn.)*

Ceylon, at an elevation of 1,000 to 2,000 feet.

4. CALOPHYLLUM CORDATO OBLONGUM, *Thw* —A very large tree, branches tetragonal glabrous (young ones with the petioles and peduncles ferrugineo pilose), leaves oblong obtuse, slightly narrowed at the base, cordate, 4 6 inches long by 2-3 inches broad, the parallel veins a little prominent on both sides, petioles 2 3 lines long, panicles terminal about equal to the leaves, pedicels and flower buds furnished with pale fulvous tomentum, sepals 4, the 2 interior larger and petaloid, petals 4, orbicular ½ an inch long. *Thw. En. Pl. Zey.* p. 407.

A very handsome tree. Ceylon, Hinidoon pattoo ; in flower in September.

5. CALOPHYLLUM TRAPEZIFOLIUM, *Thw.*—A large tree, branches glabrous, leaves coriaceous small ovato-trapeziform obtusely and shortly acuminate or retuse, 1½-2 inches long by 7-11 lines broad, petioles 3-4 lines long, racemes much longer than the leaves flowers rather large, sepals 4, petals 4, fruit subspherical 8 lines long, 7 lines broad. *Thw. En. Pl. Zey. p.* 51.

Ceylon, Central Provinces, 4,000—5,000 feet elevation, in the Hunasgiri district.

6. CALOPHYLLUM INOPHYLLUM, *L.*—A middling sized tree, branches terete, leaves elliptical passing into obovate, sometimes, emarginate, racemes axillary loose, sepals 4. exterior smaller interior about equal to the petals (pure white) all petaloid, petals 4, stamens numerous irregularly polyadelphous near the base, ovary globose (reddish purple), elevated on a short gynophore, fruit spherical, about the iszo of a large cherry. *Wight Ill.* p 128.

A very beautiful tree, sometimes called the Alexandrian laurel ; in Malabar it is called Pine by the natives, in Teligu Poonas in Hindoostani Sultan Champa, and in Ceylon Domba. It is very common in Malabar, and is largely planted in many parts of the Madras Presidency, particularly near the coast ; the flowers are delightfully fragrant, the wood though coarse grained is considered very valuable for some purposes in ship-building ; the seeds afford a good lamp oil.

7. CALOPHYLLUM TOMENTOSUM, *Wight* —A good sized tree, young shoots square and with the petioles and peduncles thickly clothed with ferruginous tomentum, leaves varying from oval to narrow lanceolate attenuated at both ends undulated on the margin racemes axillary, loose, few flowered, sepals 4, petals 4. *Wight Ill. p.* 128 ;—*Thw. En. Pl. Zey. p.* 51.

Ceylon, 3,000 to 5,000 feet elevation, very abundant; the timber is valued for building purposes, and the seeds are largely collected for their oil which is called "Keenà tel."

8. CALOPHYLLUM BRACTEATUM, *Thw.*—A very large tree, young branches square pendulous furnished with caducous ferruginous tomentum, leaves lanceolate acuminate, 3½-8 inches long by 1-2¼ broad, petioles 2-4 lines long, young ones pilose with caducous tomentum, racemes conspicuously bracteated tomentose, much shorter than the leaves 4-8 flowered ; pedicels 1 bracteated at the base, bractes oblong tomentose 2 3 lines long, flowers 4 lines in expansion, fruit (immature) oblong. *Thw. En Pl. Zey. p.* 51.

Ceylon, Suffragram district, at no great elevation on the banks of streams

9. CALOPHYLLUM ELATUM, *Bedd.*—For description, &c., see Plate ii.

Sepals 4, *Petals* 0.

10. CALOPHYLLUM WIGHTIANUM, *Wall* —For description, &c., see Plate xc.

11. CALOPHYLLUM MOONII, *Wight.*—A large tree, young branches terete clothed with fugacious ferruginous tomentum, leaves linear-lanceolate acute 8 12 inches long by 1½ broad, floral ones about oval, flowers short pedicelled forming numerous short umbellate panicles, panicles axillary solitary congested towards the ends of the branches forming together large leafy terminal panicles, sepals 4 the interior pair the larger, petals 0, fruit spherical. *Wight Ill. p.* 129 ;—*Thw. En. Pl. Zey. p.* 52.

Ceylon, in the forests between Galle and Ratnapoora, at no great elevation ; a tree of great beauty, called Doomba-Keena.

12. CALOPHYLLUM BURMANNI, *Wight.*—Young shoots square tomentose, leaves oval or slightly obovate spathulate sometimes subemarginate, panicles small axillary few flowered, pedicels opposite usually larger than the peduncles, furnished at the base with a small deciduous bractea, sepals 4, petals 0, fruit small globose or very slightly oval reddish brown ½ an inch in diameter. *Wight. Ill. p.* 129 ;—*Thw. En. Pl. Zey. p.* 52.

Ceylon, hotter parts of the island.

KAYEA. WALL.

For Gen. Char. see letter press to plate of Kayea stylosa, Pl. cii.

KAYEA STYLOSA, *Thw.*—For description, &c., see Plate cii.

MESUA. LINN.

For Gen. Char. see letter press to plate of Mesua Coromandelina, Plate lxiv.

1. MESUA COROMANDELINA, *Wight.*—For description see letter press to plate of this species, Pl. lxiv.

2. MESUA SPECIOSA, *Choisy.*—A lofty tree, leaves narrow lanceolate attenuated at the base and ending in a longish blunt acumen dark shining green above, and glaucous-white beneath, 5-8 inches long by 1-1½ broad, petioles ¼ to ½ inch long; flowers subsessile 3-4 inches in expansion, petals roundish regular; ripe fruit 4 seeded. *DC.* 1 *p.* 562 ;—*Rheede Hort. Mal.* 3. *t.* 53. *excl. syn.*

A common tree in all the western forests of the Madras Presidency, up to nearly 5,000 feet; it is well known by the names of Nàgà, nàng, and nàngal, which names are also applied to the other species. All the mesuas yield a very hard reddish colored wood known as iron wood, and the timber of the different species are not distinguishable; they are very showy trees, and are much planted for ornament about temples in hilly places by natives. The timber is most valuable for engineering purposes, but is as yet but little utilized; the seeds yield an oil which is used for burning.

The Ceylon tree referred to this species by Dr. Thwaites, has been separated by Messrs. Planchon and Triana under the name of M. Thwaitesii.

3. MESUA FERREA, *Linn.*—A very large beautiful tree, with slender pendulous ramuli, leaves lanceolate acute at both ends ending in a long tapering acumen bright shining green above, beneath white from a thick coating of pulverulent incrustation; flowers yellow axillary solitary subsessile. *Linn. sp.* 734 ;—*Wight Ic. t.* 118.

Vary. *α.* leaves lanceolate.

Vary. *β.* leaves linear.

The broad leaved variety is found both in Ceylon and on the Nilgiris, Anamallays, and other parts of the peninsula; the narrow leaved variety I have only seen from Ceylon. They are both made into new species by Messrs. Planchon and Triana, the former being called M. Walkeriana, and the latter M. salicina; the name of ferrea being, I suppose, retained for the next species, which is the ferrea of Roxburgh but not of Linnæus. The young leaves are of a very brilliant red color, the timber is very durable under water; it is straight grained hard and difficult to work; when seasoned it weighs about 75 lbs the cubic foot.

4. MESUA ROXBURGHII, *Wight.*—A large tree, branches rather rigid, leaves lanceolate shortly acuminate bright shining green above, glaucous beneath, flowers terminal solitary or paired (one from the axil of each terminal leaf) short pedicelled, petals subunguicu late obcordate curled on the margin, capsule about the size of a crab apple, nearly round with an acute point 1-celled 1-4 seeded the partition nearly obliterated 2 valved. *Wight Ill.* p. 127. M. ferrea, *Roxb. Fl. Ind.* ii. 605, *not Linn.*

Calcutta, Eastern Bengal, Orissa, and northern parts of the Circars. Much cultivated about temples and in gardens on the eastern side of the Madras Presidency. The tree differs from the true M. ferrea of Ceylon in having a more rigid habit, and in the flowers being solitary, or at the most only one pair at the apex of the branches, instead of occupying the axils of many pairs of leaves all along the branch.

5. MESUA SCLEROPHYLLA, *Thw.*—A large tree, leaves very coriaceous almost veinless, lanceolate or oblongo-lanceolate acuminate, rounded at the base dark shining green above, very white beneath, 3-4 inches long by ¾-2 inches broad, petioles 2-3 lines long, flowers of middling size axillary and terminal, solitary on short peduncles. *Thw. En. Pl. Zey p.* 407. M. speciosa, vary. *β., Thw. l. c.p.* 50.

Ceylon, in the Reigam Corle, allied to Mesua speciosa, but with smaller leaves rounded at the base.

6. MESUA PULCHELLA, *Pl. et Trian.*—A Ceylon tree nearly allied to M. Coromandelina, but with its leaves destitute of the white coating on the under side. *Thw. En Pl. Zey. p.* 406. Mesua Coromandelina, *Thw. En. Pl. Zey. p.* 50—(*not Wight.*)

Ceylon, in the damp forests between Galle and Ratnapoora, at Ambagamwa and elsewhere at no great elevation.

ORDER XIII.—TERNSTRÆMIACEÆ.

Flowers regular hermathrodite or rarely unisexual, sepals 5 (rarely 6-7) free or shortly connate imbricate the inner often larger, petals 5 (rarely 6 9) hypogynous free or often united in a ring or short tube at the base contorted or otherwise imbricate, stamens indefinite, rarely equal in number to the petals and alternate with them, hypogynous free or shortly united at the base with each other, or with the base of the petals, anthers 2 celled basifixed or versatile, disk 0. Ovary free, rarely half inferior 2-3-5-many locular, with 2 or more ovules in each cell, styles as many as the cells of the ovary free or partially or wholly united into a single style, sometimes very short with as many stigmatic lobes as cells of the ovary, fruit coriaceous or woody and indehiscent, or capsular. Seeds with or without albumen, embryo variously curved or straight. Trees or shrubs, leaves alternate or opposite undivided entire or serrate ex stipulate (or rarely stipulate.)

This order, to which belongs the tea and camelia, contains several valuable Indian timber trees. The Ternstrœmia gymnanthera and Gordonia obtusa both yield valuable timber and are both abundant in mountainous districts on the western side of the Presidency. Pæciloneuron Indicum is a valuable timber tree common in South Canara and Malabar, and Pæciloneuron pauciflorum a valua-

ble timber tree inhabiting the Travancore and Tinnevelly mountains. Eurya Japonica is a shrub or small tree much resembling the tea plant in leaf; 2 other species of Gordonia are Ceylon trees, and a second species of Ternstræmia (a shrub) inhabits that island; and one species of Adinandra (a middling sized tree.)

TERNSTRÆMIA. LINN.

For Gen. Char. see letter press to plate of T. gymnanthera, Pl. xci.

1. TERNSTRÆMIA GYMNANTHERA, *WA.*—For description, &c., see Plate xci.

2. TERNSTRÆMIA EMARGINATA, *Gard. in Cal. Journ. of Nat. Hist. vol.* vii. *p.* 447.—A glabrous shrub, 10-16 feet in height, not uncommon in the more elevated parts of Ceylon.

ADINANDRA. JACK.

Flowers hermathrodite, sepals broadly imbricate (the 2 outer passing into bracteoles), petals 5 imbricate connate at the base or free, stamens indefinite variously connate at the base, often hirsute, anthers erect basifixed, ovary 3-5 celled sometimes imperfectly, styles elongate consolidated into 1, entire or shortly 3-5 fid, ovules very numerous in each cell, placentas prominent, fruit indehiscent, seeds many small, albumen fleshy, embryo inflexed. Evergreen trees, leaves alternate, flowers solitary axillary pedunculate.

ADINANDRA LASIOPETALA, *Wight.*—A middling sized tree, branches terete minutely strigose, leaves oblongo-lanceolate obtuse or subacuminate retuse revolute at the margin minutely denticulate glabrous above, beneath minutely and sparingly strigose 2¼-4 inches long ¾-1 inch broad, peduncles axillary solitary, 1 flowered about 8 lines long, drooping, thickened at the apex, flowers 6-8 lines in diameter externally sericeo-strigose, filaments variously connate sprinkled as are the anthers with longish hairs, petals white, ovary imperfectly 3 celled, fruit globose about 5 lines in diameter, Cleyera lasiopetala. *Wight Ill. p.* 99. Eurya lasiopetala, *Gardn. in Calc. Jour. of Nat. Hist. vol.* vii. *p.* 446. Sarosanthera lasiopetala, *Thw. En. Pl. Zey. p.* 41. Adinandra lasiopetala, *Benth. and Hook. Gen. Pl.* 1. *p.* 182, and *Thw. En. Pl. Zey. p.* 405.

Ceylon, 6,000 feet and upwards. A middling sized tree.

Analysis of Genera Pl. III, fig. 3.

Flower, and young fruit and dissections of the flower and ovary, &c. of Adinandra lasiopetala, (the dissections of the ovary are from a drawing communicated by Dr. Thwaites.)

EURYA. THUNB.

For Gen. Char. see letter press to plate of Eurya Japonica, Pl. xcii.

1. EURYA JAPONICA, *Thunb.*—For description, &c., see Plate xcii.

GORDONIA. ELLIS.

For Gen. Char. see letter press to plate of G. obtusa, Pl. lxxxiii.

1. GORDONIA OBTUSA, *Wall.*—For description, &c., see Pl. lxxxiii.

2. GORDONIA ZEYLANICA, *Wight.*—A middling sized tree, glabrous, leaves sessile quite entire from elliptic to oblong lanceolate acute tipped with a small retuse glandular point, flowers axillary on short peduncles, petals 5 obcordate, stamens very numerous, anthers oblong, ovary hairy, stigmas 5 clavate. *Wight Ill. p.* 99;—*Thw. En. Pl. Zey. p.* 40.

Ceylon, 4,000 to 7,000 feet; this species (as also does the Peninsula G. obtusa) varies very much in the size and shape of the leaves and size of the flowers.

3. GORDONIA SPECIOSA, *Gard.*—A large tree, 40-50 feet, branches terete glabrous, leaves entire sessile coriaceous glabrous elliptic or ovate retuse 3-4½ inches long by 1½ to 2¾ broad, flowers large axillary sessile or shortly pedunculate, petals cordate, reddish purple 1½-2 inches long. Carria speciosa, *Gard. in Calc. Journ. of Nat. Hist.* vii. 7. Gordonia speciosa, *Thw. En. Pl. Zeyl.* p. 40.

Ceylon, rather uncommon, in damp forests 5,000 feet and upwards.

PÆCILONEURON. BEDD.

For Gen. Char. see letter press to plate of Pæciloneuron Indicum, Pl. iii.

In dissecting a quantity of flowers of P. Indicum, I find that the stamens (though sometimes in a single series free or variously united at the base) are generally in 2 series seated on the receptacle round the base of the ovary. P. pauciflorum has 4 unequal sepals, the 2 outer being much smaller than the 2 inner, 6 imbricate (not contorted) petals, and stamens 16-22 in 2 series seated on an evident torus at the base of the ovary, so that if this species remains in the genus, the generic character must be considerably altered. I have not seen the fruit of P. Indicum, and only one of pauciflorum, it was round, 3¾ of an inch in diameter, dehiscent into 2 coriaceous valves and 1 seeded.

1. PÆCILONEURON INDICUM, *Bedd.*—For description, &c., see Plate iii.

2. PÆCILONEURON PAUCIFLORUM, *Bedd.*—For description, &c., see Plate xciii.

Analysis of Genera, Pl. III, fig. 3.

ADINANDRA LASIOPETALA.

ORDER XIV.—DIPTEROCARPEÆ.

Flowers regular hermathrodite; calyx 5-fid or 5-parted, lobes imbricate or subvalvate in fruit usually enlarged, one or more growing into a wing; petals 5 contorted connate at the base or free, stamens very numerous in many series or 5-10 or 15 in 1 or 2 series inserted on to an hypogynous (rarely a subperigynous) torus, filaments often dilated below free or slightly connate, or rarely cohering with the petals, anthers erect 2 celled with equal valves or the inner shorter, dehiscing longitudinally or towards the apex connective often produced into a long beak or bristle; ovary free with a broad base or slightly adherent 3 celled with 2 ovules in each cell; style entire or obsoletely 3-fid, ovules twin in the cells pendulous or fixed laterally, anatropous or subanatropous, raphe ventral, micropyle superior; fruit free or included in the enlarged calyx, indehiscing or rarely dehiscing by 3 valves, 1-2 seeded; seed exalbuminous, embryo with equal or unequal straight or plicate thick or foliaceous cotyledons. Trees, often resinous, leaves alternate entire or sinuately dentate, stipules generally small and deciduous, or (in Shorea) sometimes coriaceous and persistent, or (in Dipterocarpus) large and soon deciduous; flowers in axillary few or many flowered panicles.

A most important forest order including many of the giants of the forest in India, Ceylon, Birmah and the Archipelago. Dipterocarpus is only represented in the Peninsula by one species, a gigantic tree, but Ceylon possesses 6 species, and the genus is abundantly represented in Eastern Bengal and Birmah and most or all of the species, yield a valuable wood oil, but their timbers do not appear to be of much value.—Vatica has also only 1 representative in the Peninsula, 2 additional ones in Ceylon, and about 6 beyond our limits. Shorea or Sàl has 3 Peninsula species, all very valuable for their timber (one the "robusta" being also abundant in Bengal, and the other 2 being confined to the Peninsula), 3 Ceylon species, and about 20 species beyond our limits. Hopea has 3 Peninsula species (1 of which is as yet only known in fruit), 2 peculiar to Ceylon, and several in Birmah and other parts, all yielding valuable timber Doona, a genus confined to Ceylon, about 10 species, some valuable timber. Vateria (the white dammer tree) 2 species, one of which inhabits the Peninsula and the other Ceylon. Stemonoporus, a Ceylon genus of Dr. Thwaites's (placed by Benth. & Hook. under Vateria, and by DeCandolle under Vatica) 15 species, and Nonoporandra, also a genus peculiar to Ceylon, 3 species. Almost all the trees are of gigantic growth, and most of them yield very valuable timber and some yield resin and others wood oil.

DIPTEROCARPUS. GÆRTN.

For Gen. Char. see letter press to plate of D. Indicus.

1. DIPTEROCARPUS INDICUS, *Bedd.*—For description, &c., see Plate xciv.

2. DIPTEROCARPUS ZEYLANICUS, *Thw.*—An immense tree, leaves very large, ovate or oblong shortly acuminate glabrous, long petioled, gemmæ villous, racemes axillary solitary bifid near the base, 6-12 flowered, aggregated at the apex of the branches, lepidote as are the petioles and costa of the leaves, the urceolate tube of the calyx when in fruit 5 ribbed. *Thw. En. Pl. Zey. p.* 33.

Ceylon, very common up to 3,000 feet elevation, called Horà; a gum-resin and wood oil is obtained from it and the other species; the wood weighs about 50 lbs. the cubic foot when seasoned, it is not durable but is very useful for centering, dam piling, and large scaffolding, and such like temporary works.

3. DIPTEROCARPUS HISPIDUS, *Thw.*—A very large tree, leaves oblong shortly acuminate, subcordate up to 19 inches long by 9 inches broad below hispid; tube of the calyx in fruit spherical or subpyriform 5 angled at the apex, lobes 6-7 inches long. *Thw. En. Pl. Zey. p.* 33.

Ceylon, in the Saffragram district at no great elevation called Boo-horà; easily distinguished by its very large hispid leaves.

4. DIPTEROCARPUS OBLONGIFOLIUS, *Thw.*—A very large tree, leaves oblong shortly acuminate rounded at the base glabrous above except the costa hispid below on the costa and veins, 5-7 inches long, 2½-4 broad, racemes solitary simple 2-4 flowered, calyx scaly, 5 angled. *Thw. En. Pl. Zey. p.* 34.

Ceylon near Ratnapoora.

5. DIPTEROCARPUS SCABRIDUS, *Thw.*—A very large tree, leaves linear oblong, shortly acuminate, slightly narrowed at the base, glabrous above, slightly scabrid beneath about 7 inches long by 2½ broad. *Thw. En. Pl. Zey. p.* 34.

Ceylon near Ratnapoora.

6. DIPTEROCARPUS GLANDULOSUS, *Thw.*—A very large tree, leaves ovate acuminate rounded at the base under surface furnished with glandular pubescence which is at first yellow, then red and finally black, 4-6 inches long by 2-2½ broad. *Thw. En. Pl. Zey. p.* 34.

Ceylon, Saffragram and Ambagamwa districts, at no great elevation called Doranà.

7. DIPTEROCARPUS INSIGNIS, *Thw.*—A very large tree, leaves ovate acuminate, hirsute on the costa and veins beneath 4-5½ inches long by 2-2½ broad, petioles 7-9 lines long very hirsute, calyx smooth longitudinally 5 bordered, subsessile on the rachis of the raceme. *Thw. En. Pl. Zey. p.* 34.

Ceylon, Saffragram district.

This genus is well represented in Birmah and Eastern Bengal, and a considerable trade is carried on in the wood oil or liquid balsam which is drawn from the trunks of the different species, and which is much in use for painting ships, houses, &c. Dr. Roxburgh describes the process of extraction as follows:—"To procure the balsam a large notch is cut into the trunk of the tree near the earth (say about 30 inches from the ground), where a fire is kept up until the wood is charred, soon after which the liquid begins to ooze out; a small gutter is cut in the wood to conduct the liquid into a vessel placed to receive it. The average produce of the best trees during the season is said to be sometimes 40 gallons; it is found necessary every 3 or 4 weeks to cut off the old charred surfaces and burn it afresh; in large healthy trees abounding in balsam they even cut a notch in some other part of the tree and char it as the first; these operations are performed during the months of November, December, January, and February; should any of the trees appear sickly the following season one or more years respite is given."

VATICA. Linn.

For Gen. Char. see letter press to plate of Vatica Roxburghiana, No. xcv.

1. Vatica Roxburghiana, *Wight.*—For description, &c., see Plate xcv.

2. Vatica affinis, *Thw.*—A very large tree, leaves oblongo-lanceolate acuminate glabrous on both sides a little rounded at the base petiolate, primary veins 5-7 on each side, panicles axillary and terminal shorter than the leaves furnished with pale fulvous scales, anthers plane obtuse, connective produced into a short point, fruit 3 sulcate depressed at the apex. *Thw. En. Pl. Zey. p.* 404.

Ceylon in the Hinidoon Pattoo and Pasdoon Corle.

3. Vatica ? cordifolia, *Thw.*—A very large tree, glabrous, branches terete leaves shining oblongo-or ovato-lanceolate acuminate obscurely and minutely reticulato-venulose, rotundato-cordate at the base 5-7 inches long by 2-3½ inches broad, petioles 1 inch long, primary veins about 7 on each side furnished with glands at the axils. *Thw. En. Pl. Zey. p.* 404.

A Dipterocarp found at Atakalan Corle in Ceylon and referred by Dr. Thwaites to this genus, but the inflorescence and fruit are unknown.

SHOREA. Roxb.

For Gen. Char. see letter press to plate of Shorea robusta, Plate iv.

1. Shorea robusta, *Roxb.*—A gigantic tree, leaves cordato-oblong 6-10 inches long by 4-6 broad, perfectly glabrous with the primary veins very prominent beneath, petioles ½-¾ inch long, stipules falcate, panicles many flowered terminal and axillary covered as are the calyx and corol on the outside with short dense white woolly tomentum, petals much attenuated towards the apex 12-13 nerved, stamens very numerous, filaments very broad and dilated below, apiculate below the anther, anthers bearded connective produced into a point with a bearded apex, style thick attenuated upwards pubescent 3 denticulate at the apex, calyx in fruit furnished with minutely stellate pubescent or glabrescent wings about 2 inches long rounded at the apex about 10 nerved.

For further account of the tree see Plate iv

Shorea Tumbagaia, *Roxb.*—A gigantic tree, young branches petioles and panicles and under surface of the leaves hoary with minute stellate scale-like tomentum, pedicels calyx and outside of petals very white with soft hairy tomentum, leaves ovate with a short very blunt point, rounded or slightly cordate or retuse at the base 2½ to 8 inches long by 1½-4½ broad, primary veins very prominent beneath, petioles 1-2 inches long, panicles axillary and terminal many flowered, flowers fragrant secund, more than ½ an inch in length, petals attenuated upwards, glabrous and yellow inside, anthers very numerous 33-55, filaments broad and dilated below and more or less united together at the base, apiculate below the anthers, connective terminating in a single hairy bristle, style thick slightly attenuated upwards 3 denticulate at the apex, fruit furnished with dense silky pubescence towards the apex, wings of the fruit bearing calyx very unequal, 3 being much longer than the other two, all more or less pubescent and strongly 8-10 nerved.

For further account see letter press to Plate No. V.—*The figure there given is reproduced from Dr. Wight's Icones, and is a very faithful representation, but I have been induced to give a fuller description, as DeCondolle in the 16th part of his Prodromous makes two species out of this tree, assigning the name of penicillata to Wight's plant, and Tumbagaia to Roxburgh's, and giving 35 anthers to the former and 100 to the latter. I have very carefully explored all the Cuddapah and North Arcot mountains which go by the name of Balaghat, and this is the only species of Sal found there besides laccifera, and as it is universally known by the name of Thumba, there can be no doubt, I think, that it is Roxburgh's plant, and that his describing it as having 100 anthers is a mistake or a misprint; the anthers are very small, and could not be counted except under the microscope, but I never find much over 50; but about that number are constantly present. I have not met with the tree anywhere on the western side of the Presidency; the flowers are much larger, and the leaves differently shaped to those of S. oblongifolia, a Ceylon tree.*

3. Shorea laccifera, *WA.*—A large tree, young branches, under side of the leaves, stipules, and outside of the petals minutely hairy; leaves from ovate with a blunt acumination and small mucro, to exactly oblong, 2-7 inches long by 1½-3 broad, coriaceous glabrous above, primary veins prominent beneath, stipules rather large linear falcate very soon caducous, panicles numerous from the axils of the fallen leaves and about equalling the leaves in length, flowers ½-¾ inch long, calyx glabrous or subglabrous, lobes ovate acute, stamens 15, filaments slightly adherent to the base of the corol, gradually attenuated towards the apex, anther bristle very long not bearded. Style filiform rather deeply and prominently 3-cleft at the apex, wings of the fruit bearing calyx unequal 3 being ⅔rds longer than the other two, the longer wings rounded at the apex, the shorter ones subacute, prominently 7 9 nerved pubescent or subglabrous.—Shorea Talura, *Roxb. Fl. Ind.* ii. *p.* 618.

Vide Plate No. VI.—*The drawing is reproduced from Dr. Wight's Icones, and is very correct except the apex of the style, which should be prominently 3 cleft, and the stamens, which should be 15 instead of 12.*

4. Shorea oblongifolia, *Thw.*—A very large tree, leaves linear-oblong abruptly acuminate, truncato-rotundate or cordate at the base coriaceous glabrous on both sides except the costa above, 4-7 inches long by 1¾-2½ broad, petioles 6 8 lines long, young branches petioles and panicles minutely stellato-hoary, panicles supra-axillary, shorter than the leaves, flowers fragrant 4 lines long secund, pedicels very short, petals yellow strigose on the outside, stamens very numerous 80-100, connective produced into a very long glabrous awn, fruit bearing calyx produced into 5 wings 2 of which are small or obsolete, the other three are about 2½ inches long and gradually broader upwards and rounded at the apex, all minutely tomentose and much more open than in Shorea Tambagaia, fruit tomentosely hoary. *Thw. En. Pl. Zey. p.* 36.

Ceylon, south of the island, at no great elevation, allied to, but quite distinct from S. Tambagaia; this tree will probably yield a very valuable timber.

5. Shorea lissophylla, *Thw.*—A large tree, glabrous, leaves ovate or ovato-rotundate abruptly and shortly rostrate, rounded or subcordate at the base, primary veins about 7 on each side prominent on the underside, veinlets inconspicuous, 3-5 inches

long by ½-3 inches broad, petioles ½ an inch long rugulose, panicles glabrous many flowered, pedicels very short and with the flower buds minutely pubescently-hoary, anthers bearded. *Thw. En. Pl. Zey. p.* 402.

Ceylon, in the Singhe Rajah forest and Hinidoon Pattoo at no great elevation.

6. SHOREA ? STIPULARIS. *Thw.*—Is a Ceylon tree, with large persistent stipules, which Dr. Thwaites refers with doubt to this genus, as he has not seen the inflorescence; it is found between Galle and Ratnapoora.

HOPEA.

For Gen. Char. see letter press to plate of Hopea parviflora, Pl. vi.

1. HOPEA PARVIFLORA, *Bedd.*—For description, &c., see Pl. vi.

This species is nearly allied to H. odorata, Roxb., and perhaps not specifically distinct; young branches and petioles sparingly and panicles and calyx densely tomentoso-hoary, leaves elliptic with a short blunt point ovate, or narrow oblongo elliptic glabrous above, and glabrous or subglabrous beneath, often furnished with large prominent glands along the costa at the axils of the primary veins, panicles as long or a little longer than the leaves, 2 enlarged wings of the fruit bearing calyx light straw-colored 7-9 nerved, fruit glabrous shining and viscid.

I have specimens of this tree from all parts of the western forests, South Canara, Coorg, Wynad, Nilgiris, Anamallays, Madura and Tinnevelly; they differ slightly, but all agree in their hoary panicles of very small flowers; my specimens from S. Tinnevelly, where the tree is called Nir kong, have longer and narrower leaves (5-7 inches long by 1-1½ broad) than the S. Canara specimens, and both the Anamallay and Tinnevelly specimens have rather larger flowers and the pubescence of the panicles not so dense.

2. HOPEA WIGHTIANA, *Wall.*—For description, &c., see Plate xcvi.

3. HOPEA, *Sp*—A very large tree, every where glabrous, bark dark colored peeling off and hanging in long shreds on the trunk, leaves elliptic, very narrow at the base with a very long terminal point, 4-5 inches long by 2 inches broad, primary veins distant, only 4 on each side very prominent and 1 or more of them generally furnished with very large glands in the axils, petioles ½-¾ inch long, panicles axillary about the length of the leaves, the 2 enlarged wings of the fruit bearing calyx 3-3¼ inches long by 13-15 lines broad.

This is a very distinct new species which I have only observed on the Wynad slopes and have not yet procured in flower; it is particularly abundant on the Carcoor ghat, where its curious trunks are very prominent; the timber is very hard, heavy, and durable, and very valuable for engineering purposes; it is of a deep reddish color and very different in appearance to that of the other 2 species.

4. HOPEA DISCOLOR, *Thw.*; and 5. HOPEA JUCUNDA, *Thw.*; are Ceylon trees described by Dr. Thwaites in his *En. Pl. Zey.*: they would be certain to yield valuable timber.

DOONA. THW.

For Gen. Char see letter press to plate of Doona Zeylanica, Plate xcvii.

1. DOONA ZEYLANICA, *Thw*—For description, &c., see Plate xcvii.

2. DOONA GARDNERI, *Thw.*—For description, &c., see Plate xcviii.

3. DOONA AFFINIS, *Thw.*; 4. D. NERVOSA, *Thw.*; 5. D. TRAPEZIFOLIA, *Thw.*; 6. D. CONGESTIFLORA, *Thw.*; 7. D. CORDIFOLIA, *Thw*; 8. D. MACROPHYLLA, *Thw.*; 9 D. OVALIFOLIA, *Thw.*; 10. D. VENULOSA, *Thw.*; are lofty timber trees growing in the forests of Ceylon, and are all described in Dr. Thwaites's *Enumeration Pl. Zeyl.*; the ripe seeds of D. cordifolia are roasted and eaten by the Cinghalese.

VATERIA. L.

For Gen. Char. see letter press to plate of V. Malabarica, Pl. lxxxiv.

1. VATERIA MALABARICA.—For description, &c., see Pl. lxxxiv.

2. VATERIA INDICA, *L.*—A lofty tree, found only in Ceylon, where it is called Hal; very similar to the Indian species, but differing in its much larger leaves and larger fruit, and in its anthers being auricled at the base and terminating in 2 bristles; it yields a gum resin which is burnt by the natives at their ceremonies.

STEMONOPORUS. THW.

For Gen. Char. see letter press to plate of S. Gardneri, Pl. xcix.

1. STEMONOPORUS GARDNERI, *Thw.*—For description &c., see Pl. xcix.

2. STEMONOPORUS ACUMINATUS, *Thw.*—For description, &c. see Pl. c.

3. STEMONOPORUS WIGHTII, 4. S. AFFINIS, *Thw.*; 5. S. LANCEOLATUS, *Thw.*; 6. S. CANALICULATUS, *Thw.*; 7. S. PETIOLARIS, *Thw.*; 8. S. RIGIDUS, 9. S. OBLONGIFOLIUS, 10. S. RETICULATUS, *Thw.*; 11. S. NITIDUS, *Thw*; 12. S. ? MOONII, 13. S. DISTICHUS, *Thw.*; 14 S. SCABRIUSCULUS are all trees found in the forests of Ceylon, and are all described in Dr. Thwaites' *Enumeration Pl. Zey.* No. 5 is a small tree, and Nos. 6, 7, 10 and 11 middling sized trees, and the others very large trees.

MONOPORANDRA. THW.

For Gen. Char. see letter press to plate of Monoporandra cordifolia, Pl. ci.

1. MONOPORANDRA CORDIFOLIA, *Thw.*—For description, &c., see Pl. ci.

2. MONOPORANDRA ELEGANS, *Thw.*; 3. M. LANCIFOLIA, *Thw.*; are small or middling sized trees found in Ceylon, and are described by Dr. Thwaites in his *En. Pl. Zey.*

ORDER XV.—MALVACEÆ.

Flowers regular, usually hermathrodite or rarely partially diœcious or polygamous, sepals 5 rarely 3-4 more or less united in a lobed or entire calyx, the lobes valvate, petals 5 hypogynous usually adnate at the base to the staminal column contorted in the bud, rarely wanting ; stamens indefinite or subdefinite, hypogynous more or less united at the base, the column divided into filaments at the top or bearing the filaments outside below or up to the top, anthers from globose to linear often reniform or variously waved 1 celled or spuriously divided into 2 cells by a thin and incomplete longitudinal septum. Torus small or conical and protruding into the centre of the ovary, not expanded into a disk, ovary 2 or more celled, (very rarely reduced to a single carpel) entire or lobed, the carpels verticellate round the axis or irregularly clustered. Style simple at the base, divided at the top into as many or twice as many branches or stigmas as there are cells, or rarely entire and clavate ; ovules 1 or more in each cell ascending or horizontal with a ventral or superior raphe or reversed and pendulous with the raphe dorsal, fruit dry or rarely baccate, the carpels separating and indehiscent or two valved or united in a loculicidally dehiscent capsule. Seed with the testa usually crustaceous, without or with very little albumen, cotyledons usually folded and often enclosing the curved or rarely straight radicle. Trees, shrubs (or herbs,) hairs usually stellate, leaves alternate mostly toothed lobed or divided with palmate nerves or divisions rarely digitately compound ; stipules free usually subulate or small and deciduous rarely leafy ; peduncles usually 1 flowered and articulate above the middle rarely bearing a bract at the joint or several flowered, all axillary or the upper ones forming a terminal raceme or panicle, bracteoles either none or 3 or more free or united forming an involucre (epicalyx) close to or adherent to the calyx, flowers often large.

Tribe I Malveæ.—Staminal column bearing filaments to the summit, style-branches the same number as the ovary cells ; mature carpels separating more or less from the axis.

Kydia.

Tribe II. Hibisceæ.—Staminal column truncate or five toothed at the summit, bearing the anthers or filaments on the outside or rarely at the summit also ; style-branches or stigmas the same number as ovary-cells, carpels united in a several-celled capsule, loculicidal or indehiscent.

Julostyles, Dicellostyles, Hibiscus, Thespesia.

Tribe III. Bombaceæ.—Staminal column divided at the top into numerous filaments (or the filaments or anthers variously arranged) style undivided or with very short stigmatic lobes as many as ovary-cells, carpels united in a loculicidal or indehiscent capsule.

Adansonia, Bombax, Eriodendron, Cullenia.

Malvaceæ (or Mallow-worts) are distinguished from Sterculiaceæ and Tiliaceæ by their one celled anthers, and from all others by their valvate calyx and monadelphous hypogynous stamens. It is not an order of any importance to the forester, as it yields no valuable timber. Kydia and Thespesia are small trees, the timbers of which are sometimes used, and the latter (commonly known as the tulip tree) is largely planted as an avenue tree. Cullenia (a tree in foliage exactly like the Dorian of the Straits, which also belongs to this order) is one of the largest trees in our western forests, but its timber is very soft and worthless. Bombax (the red flowering cotton tree) also ranks with our largest trees, but its timber is useless. One species of Eriodendron and one of Hibiscus are small trees of no value. Julostyles and Dicellostyles are middling sized trees peculiar to Ceylon, and Adansonia, a tree of no great height, but with a trunk of immense bulk, is an introduction from Africa, and only met with in a planted state. To this order belong numerous herbaceous plants, such as Sida, Abutilon, Urena, Pavonia and Hibiscus ; but these require no notice in this work. The true cotton plant (Gossypium) also belongs to this family.

KYDIA. Roxb.

Gen. Char. : Flowers subdiœcious, epicalyx of 4-6 patent foliaceous bracteoles, calyx campanulate 5 fid, petals 5 longer than the calyx attached by their claws to the base of the staminal column. Staminal column divided into 5 branches at the apex each bearing 3-8 sessile anthers, the branches being abbreviated and the anthers sterile ; in the female flowers, ovary 2-3 celled, ovules 2 erect, style 1, with 3 branches, stigmas large peltate dilated, in the male flowers, ovary abortive style abbreviated, capsule depresso globose 3 valved loculicidally dehiscing, seed ascending reniform.

Trees. Stellato-tomentose leaves palminerved, lobed or entire, flowers panicled.

Kydia calycina, *Roxb.*—A middling sized tree polygamous bark ash colored, head large spreading, young shoots, leaves, petioles, panicles, inflorescence, and capsules covered with a stellate pubescence and brown mealy dust, leaves broad cordate generally 3-5 angled irregularly dentate 5-7 palminerved, 1-3 of the nerves beneath often furnished with a large hollow gland about the centre 3-6 inches each way, petioles 2-3 inches long, panicles axillary and terminal, leafy, flowers whitish or pink numerous, collected in small bracteated umbellets at the apex of the branchlets, epicalyx 4-6 leaved, generally 4-5 leaved in the female, longer than the calyx, 6 in the male shorter than the calyx, petals emarginate ciliate, anthers 4 to each filament, capsule small slightly 3 lobed size of a large pea, hid in the calyx, seed brown obtusely 3 sided. Kydia calycina et fraterna, *Roxb. Fl. Ind.* iii. *p.* 188-90 ;—*Wight Ill. tab.* 879, 880. Kydia Roxburghiana, *Wight Ill. tab.* 881.

A common tree on both sides of the Presidency, and up to 5,500 feet ; it differs much in the amount of pubescence and in the inflorescence. I cannot distinguish Wight's Roxburghiana, of which I have specimens ; and a variety found in the Anamallays has shorter, few flowered panicles with the flowers larger, but does not otherwise differ. The wood is whitish straight grained, and slightly elastic, and is used for building and various other purposes, and the bark yields a good fibre ; the tree is called Pandikee in Teligu and Bendi in Mysore (Canarese), Kopasia in Ganjam districts (Oorea), and Warung on the Bombay ghats.

Analysis of Genera, Pl. III.

Dissections of ♀ and ♂ flowers of Kydia calycina, fig. 5.

JULOSTYLES. Thw.

Gen. Char. : Bracteoles of the epicalyx 4 broad subconnate, calyx short 5 fid, petals 5 joined at the base, staminal column tubical 5 toothed at the apex, adnate to the corol at the base, bearing 10 filaments, anthers reniform, ovary 2 celled, cells 2 ovuled,

ovules collateral ascending, style 2 branched, stigmas large peltate glabrous, capsule globose stellato-hispid. A tree, leaves lanceolate or ovato-lanceolate entire, 3 nerved at the base, panicles terminal. *Thw. En. Pl. Zey. p.* 30.

JULOSTYLES ANGUSTIFOLIA, *Thw.*—A middling sized tree, sparingly ramous, leaves 5-8 inches long by 1½-3 inch broad, stellately pubescent, paler beneath, petioles 3-5 lines long, panicles terminal pendulous, flowers ½ an inch broad whitish-red in the centre, branchlets of the style densely hairy. *Thw. En. Pl. Zey. p.* 30. Kydia angustifolia, *Arnt.*

Ceylon, south of the island—common. An ornamental tree.

Anaalysis of Genera, Pl. III.

Dissections of the flower of Julostyles angustifolia, fig. 4.

DICELLOSTYLES. BENTH.

Gen. Char.: Bracteoles of the epicalyx 4-6 lanceolate subconnate at the base much longer than the calyx, calyx broadly 5-fid, staminal column short bearing numerous filaments at and below the apex, ovary 2 celled, cells 2 ovuled, ovules collateral ascending, style 2 branched, branches unequal, stigmas large globose hairy, capsule globose stellato-hispid 8 ribbed, separating into 2 indehiscent cocci, seed solitary by abortion, reniform ascending, albumen fleshy, cotyledons biplicate, radicle short incurved Trees, slightly stellato-tomentose or glabrescent, leaves entire or obsoletely toothed or shortly 3-5 lobed, pedicels axillary 1 flowered.

DICELLOSTYLES AXILLARIS, *Thw.*—A middling sized tree, leaves ovato-lanceolate glabrescent paler beneath rounded at the base 2½-4½ inches long by 1¼-2 broad, petiole 2-4 inches long; epicalyx with its bracteoles 1¼-1½ inches long 3 6 lines broad, calyx very hairy on the inside, petals 1 inch long oblong subspathulate a little oblique yellowish red, and red towards the base. *Thw. En. Pl. Zey. p.* 401. Kydia axillaris, *Thw. l. c. p.* 30.

Ceylon, near Badulla, 2,000 feet elevation—an ornamental tree.

Analysis of Genera, Pl. III.

Dissections of a flower, &c. of D. axillaris, fig. 6.

HIBISCUS. LINN.

Gen. Char.: Epicalyx of 5 or more distinct or more or less connate bracteoles, calyx 5 lobed or toothed, staminal column truncate or 5 toothed at the summit, ovary 5 celled with 3 or more ovules in each cell, style simple below, dividing above into 5 branches each terminated by a capitate stigma, capsule coriaceous loculicidally 5 valved, sometimes (in H. tiliaceus) with false dissepiments, seeds reniform angular or subglobose glabrous downy or woolly. (Herbs) shrubs or small trees, leaves polymorphous, flowers generally large and showy.

This genus is represented by numerous herbs or under shrubs, but the following is the only species worth recording in this work.

HIBISCUS TILIACEUS, *Linn.*—A small tree with purplish branches marked with the annular scars made by the deciduous stipules, leaves on long stalks, coriaceous, cordate orbicular or broadly ovate acuminate, (rarely 3-5 lobed) entire or sinuous 5-7 nerved smooth on the upper, hoary on the lower surface, 3-5 inches in diameter, stalks shorter than the blades, vernation conduplicate, stipules large foliaceous oblong-ovate deciduous, peduncles somewhat woody axillary angular jointed, epicalyx cup-shaped divided about ½ down in 10-14 triangular entire teeth much shorter than the calyx, calyx nearly an inch long broadly campanulate 5-parted, segments lanceolate with a prominent downy nerve, corol 2-3 times the size of the calyx yellow with a purple spot at the base, capsule exceeding the persistent calyx oblong pentagonal downy 5 valved, valves adhering to the dissepiments, their margins papery, corrugated and turned inwards, so as to render the capsule spuriously 10-celled, seeds slightly pilose. *DC. Prod.* 1. 454;—*Oliv. Fl. of Trop. Af. p.* 207. Paritium tiliaceum, *St. Hill.*;—*Wight. Ill. tab.* 7.

A small tree common about banks of rivers on the western coast and in Ceylon, and widely distributed in other countries; the flowers are yellow in the morning and become red in the evening; ropes, cords, and fine mats are made from the fibre of the bark; the tree abounds with mucilage and in the West Indies the bark is sucked in times of famine; the timber is soft and valueless.

Analysis of Genera, Pl. IV.

Flower and fruit of Hibiscus tiliaceus, fig. 1.

THESPESIA. CAV.

For. Gen. Char. see letter press to Pl. lxiii.

THESPESIA POPULNEA, *Cav.*—For descriptions, &c., see Pl. No. lxiii.

ADANSONIA. LINN.

Epicalyx none, calyx leathery cup shaped, petals 5, staminal column dividing above into a great number of filaments, anthers reniform, ovary 5-10 celled, cells many ovuled, style longer than the stamens dividing above into as many stigmatic rays as there are cells to the ovary, fruit oblong woody indehiscent filled with pulp; seeds reniform, embryo curved, cotyledons much twisted. Trees, with a comparatively low trunk of vast circumference. leaves digitate, flowers white axillary stalked pendulous.

ADANSONIA DIGITATA, *L.*—A tree of moderate height, but with a trunk of immense thickness, smaller branches somewhat angular downy, leaves stalked digitate, stalks 4-5 inches long, leaflets oblong entire or sinuous at the margins, acuminate, smooth above

downy below, 2-3 inches long, peduncles solitary axillary 1 flowered twice the length of the leaves pendant, calyx cup-shaped 5 cleft, lobes oblong obtuse leathery velvetty inside, petals 5 roundish leathery white spreading alternately reflected, twice or thrice the size of the calyx, 5-6 inches in diameter, column of stamens entire below, above broken up into a great number of filaments bearing 1 celled anthers, style long, stigma of 7-10 spreading rays, ovary ovate silky, flowers in May before the leaves. *Oliv. in Fl. Trop. Africa p.* 212.

This is a famous Baobab or Monkey-bread-tree, a native of upper Guinea, but found in a cultivated state in many parts of this Presidency ; the timber is pale colored, light, soft and useless ; the bark furnishes a cordage ; all parts of the tree abound with a thick mucilaginous juice, which is drawn in Africa, and used in various ways ; and the young leaves pounded are used as a condiment. The fruit, which resembles a citron in shape, is filled with reddish spongy pulp of a sweetish acid taste, of which agreeable and refreshing acidulous drinks are prepared and employed as a cooling beverage in fevers.

BOMBAX. L.

For Gen. Char. see letter press to Pl. lxxxii.

Bombax Malabaricum, *DC.*—For description, &c., see Plate No. lxxxii.

ERIODENDRON. *DC.*

Epicalyx none, calyx cup-shaped 5 toothed, staminal column divided at the apex into 5 divisions each bearing 3 sinuous anthers, ovary 5 celled, ovules numerous, style club shaped pentagonal, capsule coriaceous downy within. Seeds obovoid embedded in wool. Spiny tree with digitate leaves and large axillary terminal rose-coloured or white flowers.

Eriodendron anfractuosum, *DC.*—A large tree, spiny when young, trunk dilated at the base, branches verticellate, leafstalks 4-6 inches long terminating in a small suborbicular disk, from which proceed in a digitate manner 7 shortly stalked lanceolate acuminate undulate leaflets smooth on both surfaces, 4-6 inches long 1-1½ inches broad, calyx ¾ inch long leathery cup shaped with 5 shallow rounded lobes, corol 3 or 4 times the length of the calyx ; petals oblong obtuse white or rose coloured villous outside glabrous within, stamens united into 5 bundles each bearing 3 sinuous anthers, capsule ovate oblong 5-8 inches long, 5 valved, many seeded, seeds woolly. *Oliver Fl. Africa p.* 214. Bombax pentandrum, *Linn. p.* 959 ;—*Roxb. Fl. Ind.* iii. *p.* 165.

A common tree, much planted about villages and temples ; it is known as the white-flowering cotton tree, and called Sufaid Simal in Hindustani ; its timber is soft and useless.

Analysis of Genera, Pl. IV.

Dissections of the flower of Eriodendron anfractuosum, fig. 2.

CULLENIA. Wight.

Gen. Char. :—Epicalyx tubulose slightly 3 toothed deciduous, calyx tubular 5 toothed, petals none, staminal column 5 cleft above, anthers small subglobose forming numerous capituli on the branches of the column, ovary 5 celled, ovules 2 in each cell superposed, style elongate stigmatose at the apex, fruit globose densely muricated at length 5 valved, seed furnished with a fleshy aril, cotyledons unequal thick fleshy.

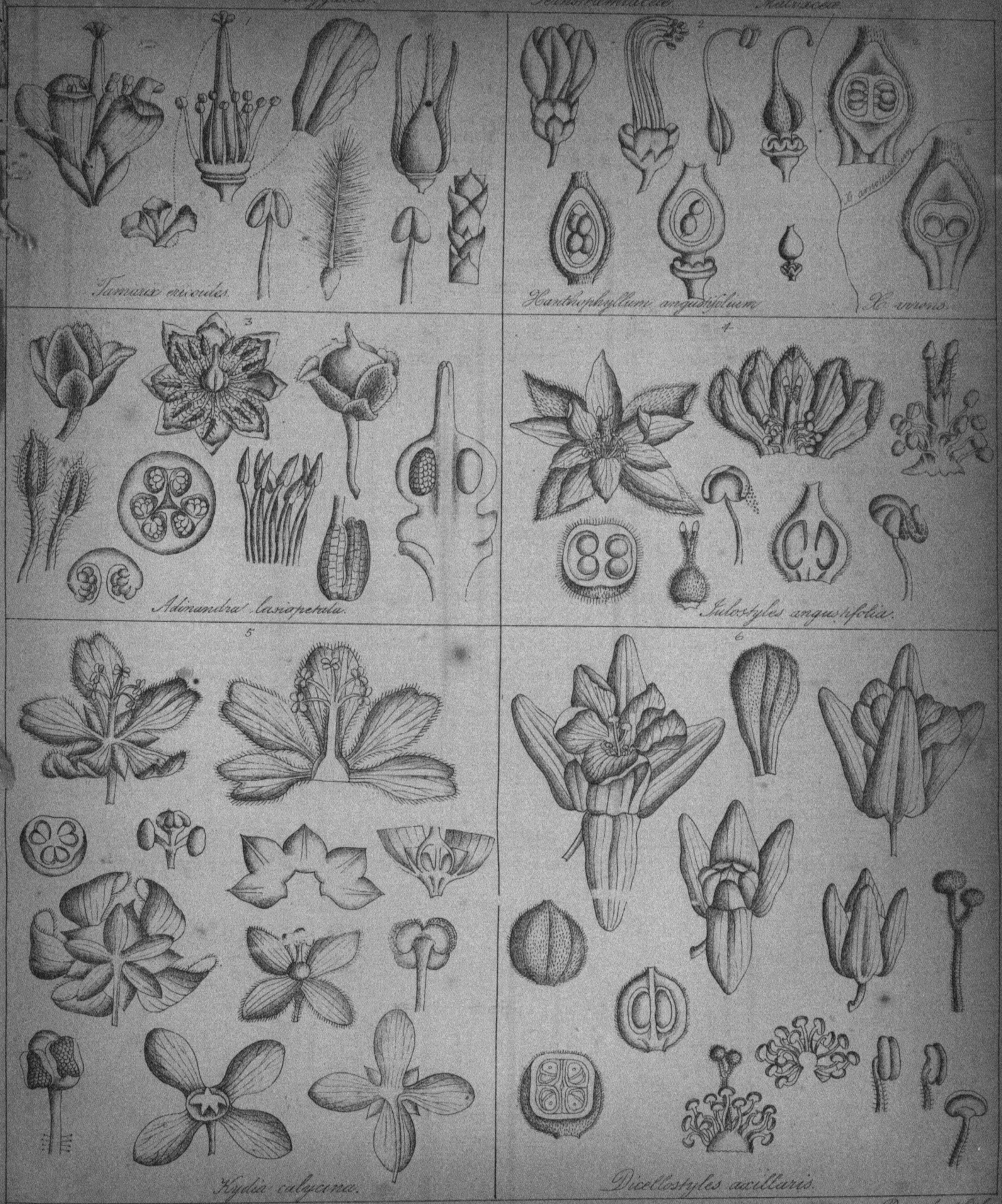
A very lofty tree, leaves silvery beneath with dense white scales, flowers subsessile congested in compact clusters on the naked branches. *Wight Ic. tab.* 1761 *and* 1762.

Cullenia excelsa, *Wight.*—A gigantic tree, bark brownish rather smooth, branches spreading, leaves elliptic oblong with a short blunt acumen, bright shining green above, silvery beneath from numerous adpressed scales (like Elœagnus), flowers congested in compact clusters on the naked branches, short pedicelled, pedicels jointed at the base, epicalyx and calyx thickly clothed with adpressed brown scales, fruit about the size of a large orange beset on all sides with hardish prickles, testa of the seed pale chestnut. *Wight l. c.* Durio Ceylanica, *Gardn. in Calc. Journ. of Nat. His. vol.* viii.

This is one of the largest trees in our western mountains, up to 4000 feet, and is very common on the Anamallays, western slopes of the Nilgiris, Wynad, Coorg, Travancore, &c, and in Ceylon. The wood is beautifully white but very soft and worthless ; the tree is often called Ainee pillaò, but that name is also given to the Artocarpus hirsutus. In Ceylon it is called Kattoo-bodde and Kattooherileya.

Analysis of Genera, Pl. IV.

Dissections of the flower, &c. of Cullenia excelsa, fig. 3.



Govindoo, del. Dumphy, Lith.

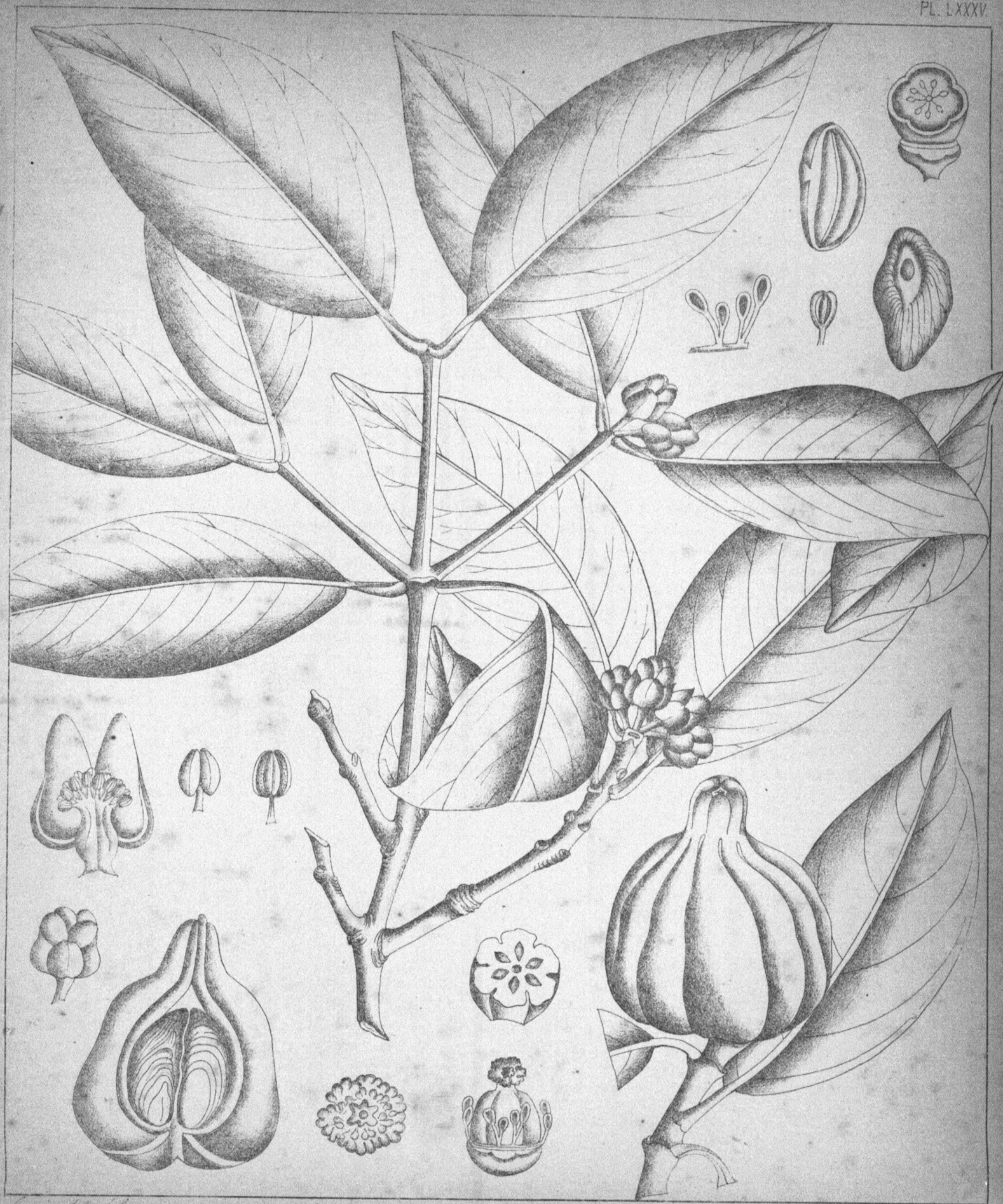
GARCINIA CAMBOGIA. (Nat. order Guttiferæ.)

GARCINIA. *Linn.*—GEN. CHAR. Flowers diœcious or polygamous, sepals 4 in opposite pairs, petals 4; male flower, stamens indefinite free monadelphous or tetradelphous, anthers erect or peltate dehiscing longitudinally or circumscissile, female or hermathrodite flowers, staminodia various free or united, ovary 2 many celled, stigma sessile lobed, smooth or tuberculate, ovules solitary, fruit baccate, embryo an undivided thick radicle (tigella)--Glabrous trees, usually with a yellow juice, leaves coriaceous or submembranaceous, opposite or ternately verticellate, flowers solitary, fascicled or subpaniculate axillary or terminal.

GARCINIA CAMBOGIA. (Desrous.) A good sized tree, leaves lanceolate of a deep lucid green, 4-6 inches long by about 2 broad, flowers terminal or axillary, sessile sub-sessile or pedicelled solitary or several together; male, anthers numerous on a short thick androphore oblong 2-celled, dehiscing longitudinally introrse; female, staminodia surrounding the base of the ovary in several phalanges each containing 2-3 sterile spathulate stamens (or free and as many or twice as many as the cells of the ovary ?) stigmas 5-10 lobed papillose with glands, ovary 6-10 celled, fruit 2½-3 inches in diameter yellow or reddish, 6-10 sulcated, 6-10 seeded, nearly globular or ovate or somewhat elongated, furrows broad with angular edges, and intervening flattened or only slightly rounded ridges, the furrows not being continued to the apex which is smooth and depressed and often nipple-shaped.—*DC. Prod.* 1. 561;—*WA. Prod. p.* 100. Garcinia Kydia, *WA. Prod. p.* 101. Cambogia gutta, *Linn. in part.* Garcinia Roxburghii, *Wight Ill. p.* 125? Garcinia papilla, *Wight Icones tab.* 960.

Common in all the western coast forests of the Madras Presidency, and in Ceylon; the pigment which exudes from the trunk is semitransparent, very adhesive and quite unsuitable as a paint; the acid rinds of the ripe fruit are eaten, and in Ceylon they are dried and eaten as a condiment with curries.

The tree is called Heela by the Burghers on the Nilgiris, and it yields an excellent straight grained lemon colored slightly elastic wood, which is easily worked, and would answer for common furniture.



Govindan del. Dumphy Lith.

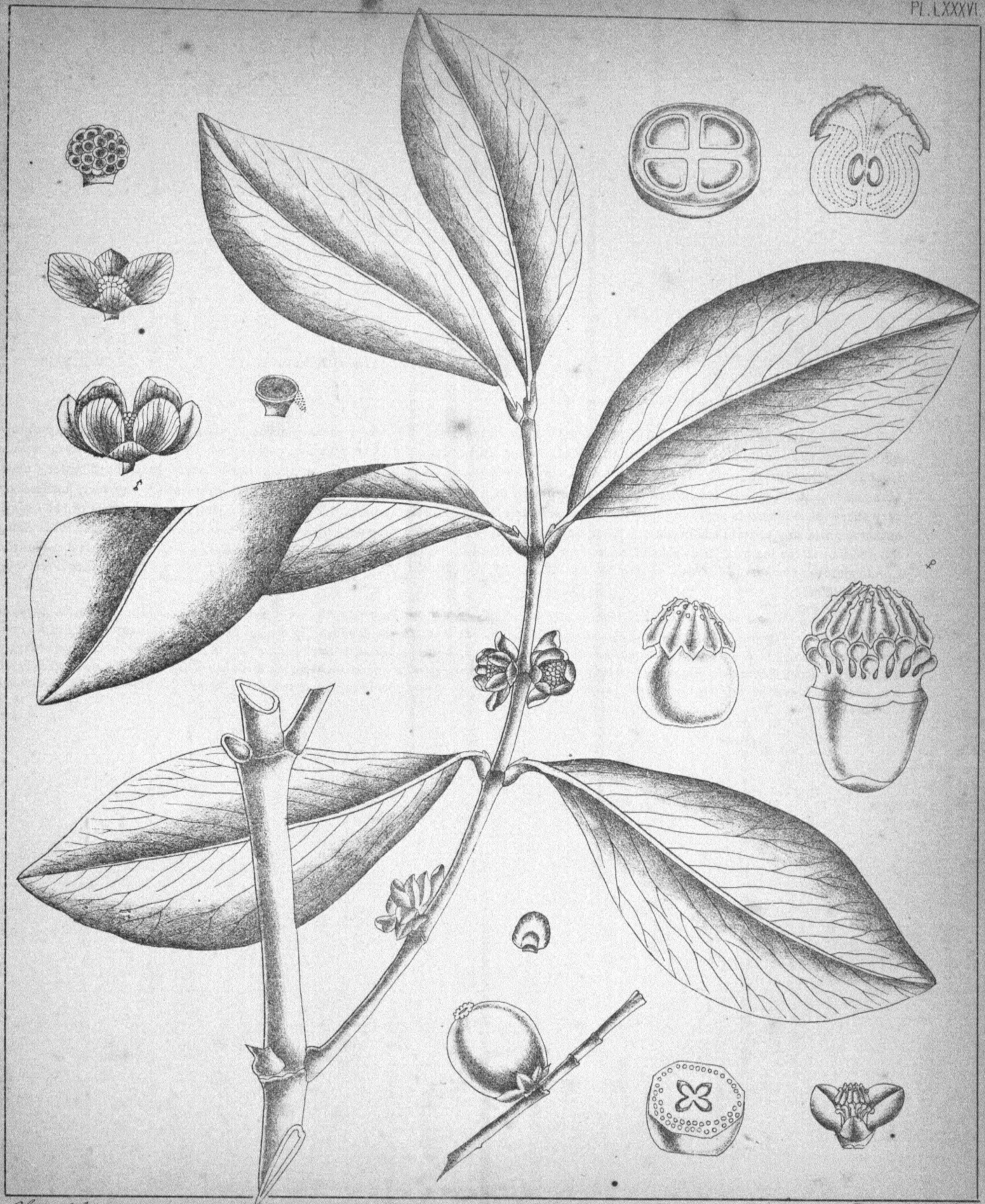
Garcinia Cambogia. (Desrous.)

GARCINIA MORELLA. (Nat. order Guttiferæ.)

For Gen. Char. see under "G. Cambogia," Pl. lxxxv.

GARCINIA MORELLA. (Desrous.) A middling sized tree, everywhere glabrous, leaves elliptic with a very obtuse blunt point and gradually attenuated at the base, about 4 inches long by 1½ to 2 broad, petioles about ¼ inch long, flowers sessile several together in the axils of the fallen leaves, calyx of 4 unequal sepals the 2 inner being much larger than the 2 outer; male, stamens about 26 closely packed on a raised receptacle in the centre of the flower without any rudiment of an ovary, anthers on very short thick filaments depressed peltate circumscissile; female flower, stamens 18-20 in one series round the base of the ovary, anthers sterile subquadrate emarginate at the apex, ovary glabrous 4 celled crowned with a large sessile 4 lobed stigma the lobes being 2-3 toothed at the margins, fruit size of a cherry globose 4 seeded. Cambogia Gutta, *Linn. Fl. Zeyl. p.* 87 *in part.* Hebradendron Cambogioides, *Graham in Hook. Comp. to Bot. Mag. Vol.* ii. *p.* 199, *t.* 27. Garcinia gutta, *Wight Ill.* 1. 126 *and tab.* 44. G. elliptica, *Wall.*

South Canara, moist forests of the plains and ghats, up to 2,000 feet elevation. Ceylon, up to 2,000 feet elevation; called Gokatoo or Kana-goraka in Ceylon, and Aradal and Punar puli in S. Canara; it is the true Gamboge of commerce, and the pigment which exudes from wounds in the trunk is largely collected and exported from Ceylon and Siam; but little or no attention seems to be paid to it in this country. In this Presidency I have only met with the tree in S. Canara, though it probably occurs elsewhere; it is closely allied to G. pictoria, which is our common species, and scarcely distinguishable except by the female flower. The drawing is from specimens collected in S. Canara, and the analysis from fresh flowers.



Alois, del. Dumphy Lith.

Garcinia Morella. (Desrous)

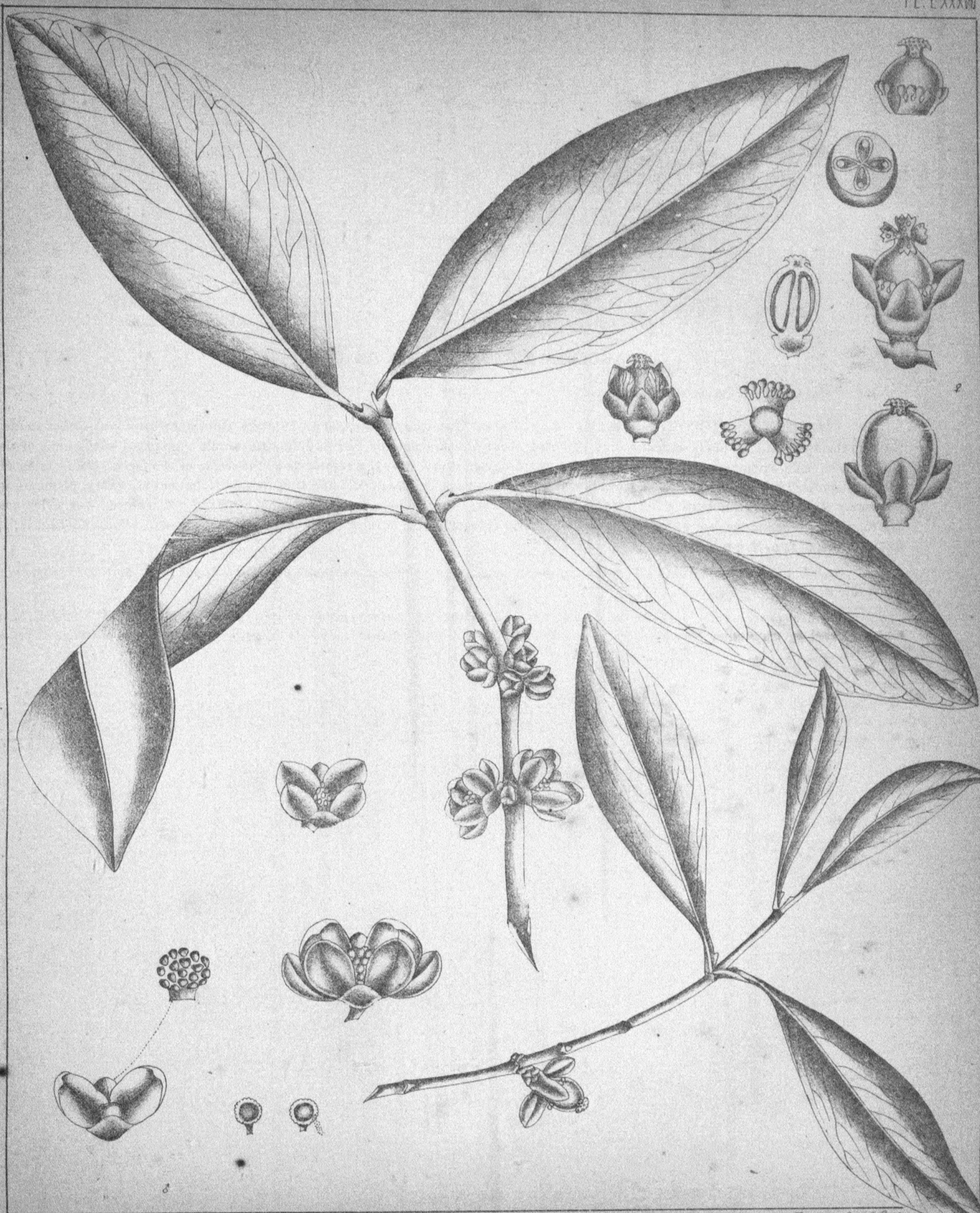
GARCINIA PICTORIA. (Nat. ord. Guttiferæ.)

For Gen. Char. see under "G. Cambogia."

GARCINIA PICTORIA. (Roxb.) A good sized tree, everywhere glabrous, leaves elliptic with a blunt rather sudden point at the apex, and gradually attenuated at the base, about 4 inches long by 1½ broad, flowers sessile aggregated in the axils of the fallen leaves; male, stamens numerous closely packed on a fleshy more or less 4 sided receptacle in the centre of the flower, filaments short, anthers depressed peltate circumscissile, no rudiment of an ovary; female, staminodia in a ring round the base of the ovary, filaments in 3-4 rarely 5 phalanges each bearing 2-7 sterile clavate anthers, ovary oblong 4 celled, stigma sessile of 4 verrucose lobes which are 3-4 toothed at the margins, berry size of a large cherry oval oblong smooth crowned with the permanent stigma. *Roxb. Fl. Ind.* ii. p. 627. (Desc. of fem. flower incorrect.)

This is a very common tree in all our western forests up to about 3,500 feet elevation; it is closley allied to G. Morella, but differs in the female flower.

Mr. Broughton has analyzed some of the pigment, and informs me that it is excellent and quite equal to that of G. Morella. The timber is used by the natives for various purposes. The drawing is taken from fresh specimens collected about the foot of the Nilgiris below Makurty.



Govindoo. del. Dumphy Lith.

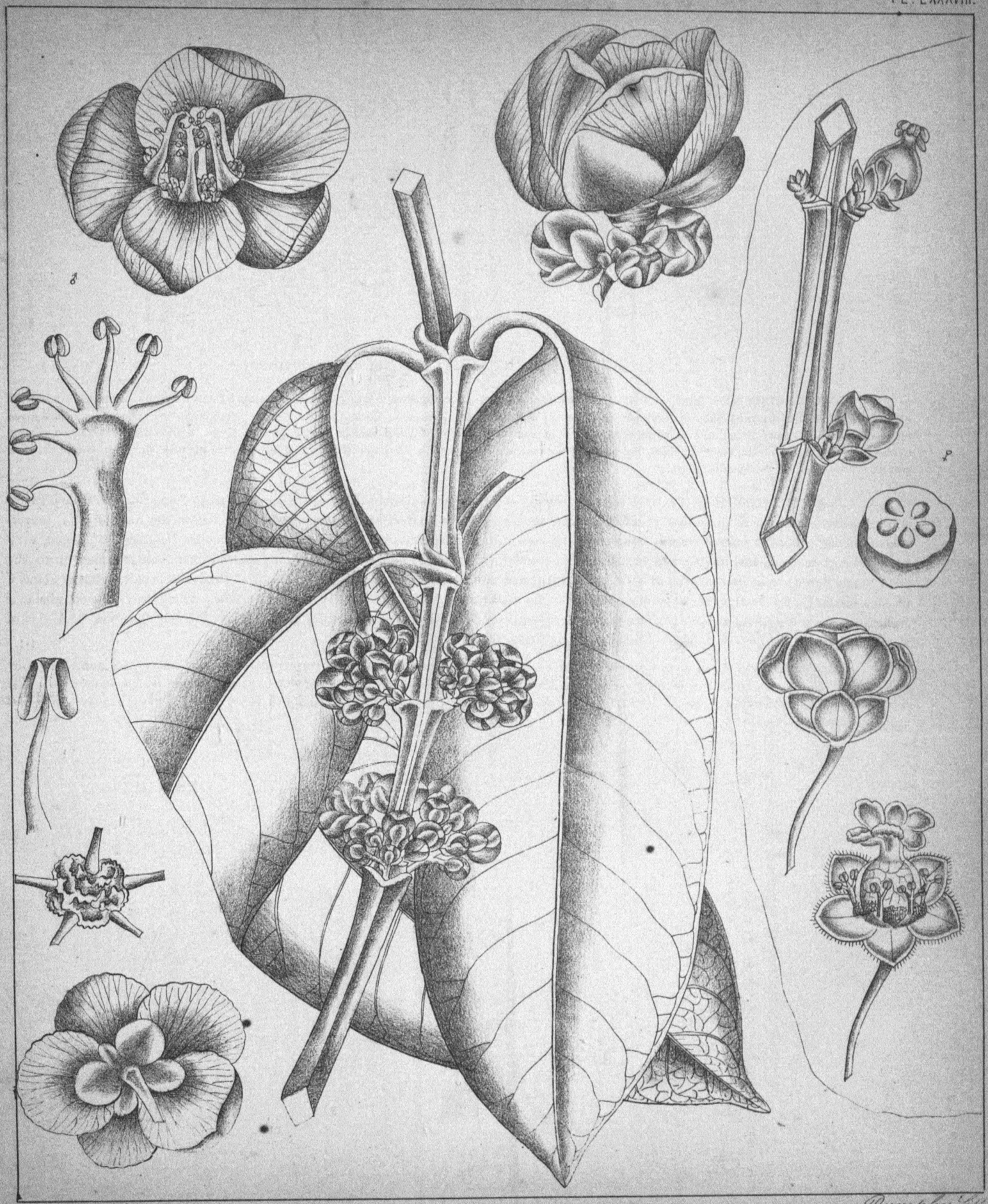
Garcinia pictoria. (Roxb.)

XANTHOCHYMUS PICTORIUS. (Nat. order [illegible] Guttiferæ.)

XANTHOCHYMUS. *Roxb.*—GEN. CHAR. Flowers polygamous or diœcious, sepals 5 [illegible] imbricate, petals 5; male flowers, stamens in 5 narrow oligandrous phalanges inserted into or between the lobes of a fleshy disk; female or herm[illegible]hrodite flower, staminodia or stamens in 5 phalanges alternating with as many glands and seated round the base of the ovary, ovary 3-6 celled [illegible] a subsessile discoid entire or radiately 3-6 lobed stigma, ovules solitary, fruit baccate, embryo thick fleshy with inconspicuous cotyledons. Tre[illegible]es, resembling Garcinia and scarcely differing except in their pentamerous instead of tetramerous flowers.

XANTHOCHYMUS PICTORIUS. (Roxb.) A very beautiful [illegible] middling sized tree, with a most dense foliage of dark green shining leaves, everywhere glabrous, young branches square, sharply ang[illegible]ted and often dilated just below the axils of the leaves, leaves oblong, generally more or less attenuated at the base with a short a[illegible]ute point at the apex, 8-14 inches long by 2-3¼ broad, very hard and coriaceous dark shining green with the veins obscure, (when fre[illegible]) petioles ½-1 inch long dilated near their insertion on to the stem; male flowers numerous sessile or subsessile aggregated into dens[illegible] short fascicles in the axils of the fallen leaves, stamens about 7 on each phalange, no vestige of an ovary; female or hermathrodite [illegible]owers solitary in the axils of the fallen leaves, each phalange furnished with 2-3 anthers at the apex (apparently fertile), ovary 5-6 [illegible]led crowned with a large dilated 5-6 lobed stigma, fruit size of an apple. *Roxb. Fl. Ind.* ii. *p.* 633. Stalagmites pictorius, *G. Don*, *but I have also met with it in Wynad, S. Canara, the western slopes of*

This very beautiful tree is very abundant in the woods in Coor[illegible]cy, and on the Bombay ghats; and it is cultivated in gardens. The Nilgiris, and other localities in the western side of the Madras Presi[illegible] tree yields a gamboge, but I do not know of what quality. I am not specimens figured were gathered below Sisparah on the Nilgiris. Th[illegible] acquainted with the timber.



Govindoo, del. Dumphy, lith.

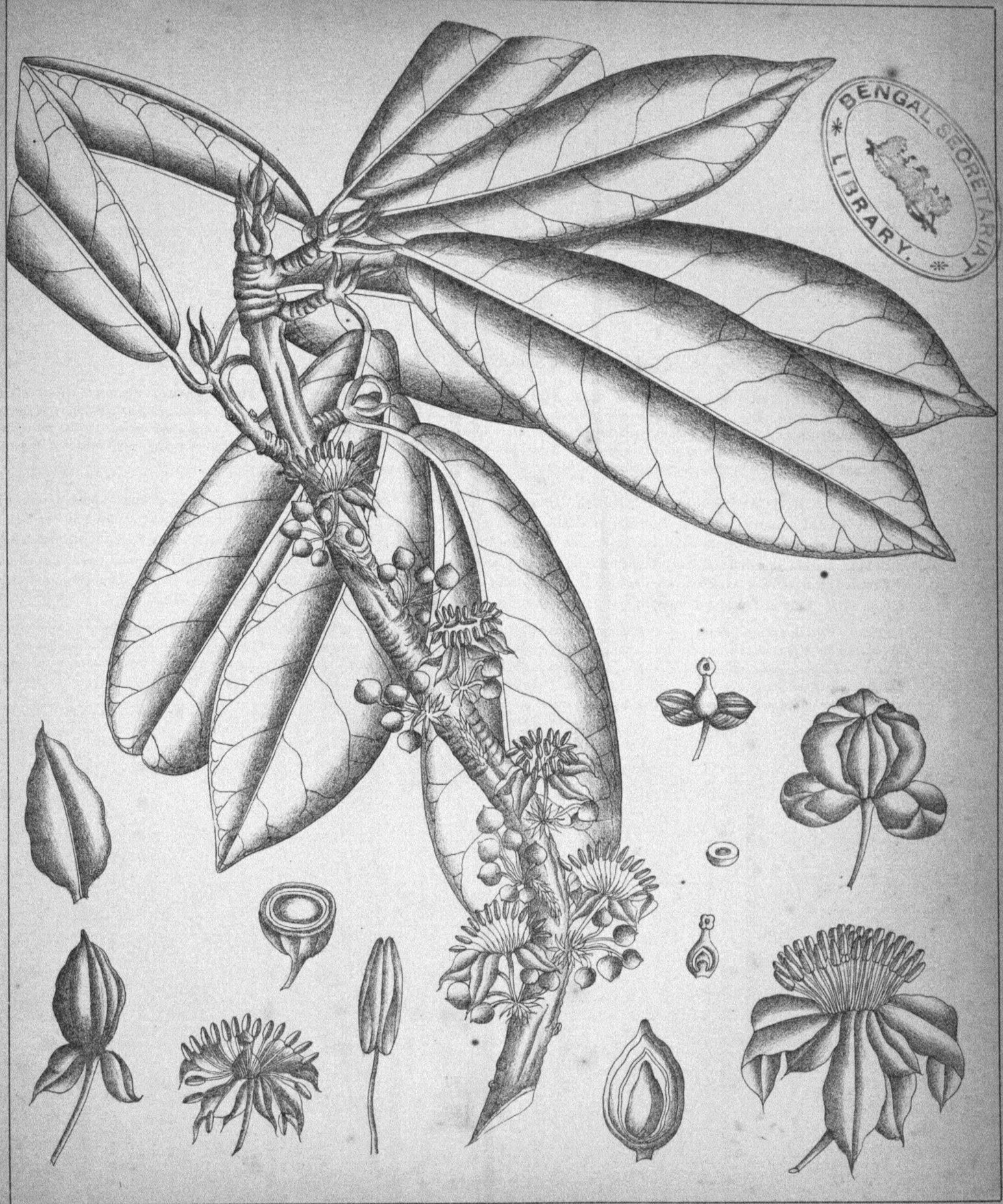
Xanthochymus pictorius (Roxb.)

OCHROCARPUS LONGIFOLIUS. (Nat. ord. Guttiferæ.)

OCHROCARPUS. *Thouars.*—GEN. CHAR. Flowers polygamous, calyx closed before flowering, at length opening in 2 valves or sepals, petals 4, stamens indefinite shortly connate below or free, filaments filiform, anthers erect oblong or linear dehiscing longitudinally, ovary 2 celled, style short thick. stigma large peltate slightly 2 lobed, ovules 2 in each cell, fruit baccate 1-4 seeded, seeds large, embryo of a large fleshy radicle (tigella) with the cotyledons reduced to a mammiliform projection or none. Trees, with opposite or ternately verticellate coriaceous leaves, and axillary fascicles of flowers. *Benth. and Hook. Gen. Pl.* 1. 980. Calysaccion, *Wight Ill.* 1. 130.

OCHROCARPUS LONGIFOLIUS. (Benth. & Hook.) A large tree, everywhere glabrous, young shoots terete or slightly 4 sided, leaves opposite or ternately verticellate oblong with a short blunt point, rounded or slightly attenuated at the base, hard thick and coriaceous, venation inconspicuous (but beautifully reticulated when dry), 6-10 inches long by 2-3½ broad, petioles ¼ inch long, flowers numerous in short fascicles congested on lateral tubercles springing from the axils of fallen leaves, peduncles short 1 flowered, fruit oblong falcate about one inch long by 5 lines in diameter. *Benth. and Hook. Gen. Pl.* i. *p.* 980. Mammea longifolia, *l. c. p.* 176. Calysaccion longifolium, *Wight Ill. p.* 130 ; *et Icones tab.* 1999. Calophyllum longifolium, *Wall. Cat.*

This tree is indigenous on the Malabar, Concan and Bombay ghats, and is cultivated in the Banglore gardens, Northern Circars and elsewhere ; the tree is diœcious, or at least monœcious in a wild state, but becomes often hermathrodite when in cultivation. The tree flowers in March and April, and the flowers are white streaked with red ; the globular flower buds are used for dyeing silk, and are dried and exported from the Bombay Presidency, where the male tree is called Woondy and the female Poone, both being also known under the name of Suringel or Gardoondy. I am not acquainted with the timber, but it is said to be used in house building.



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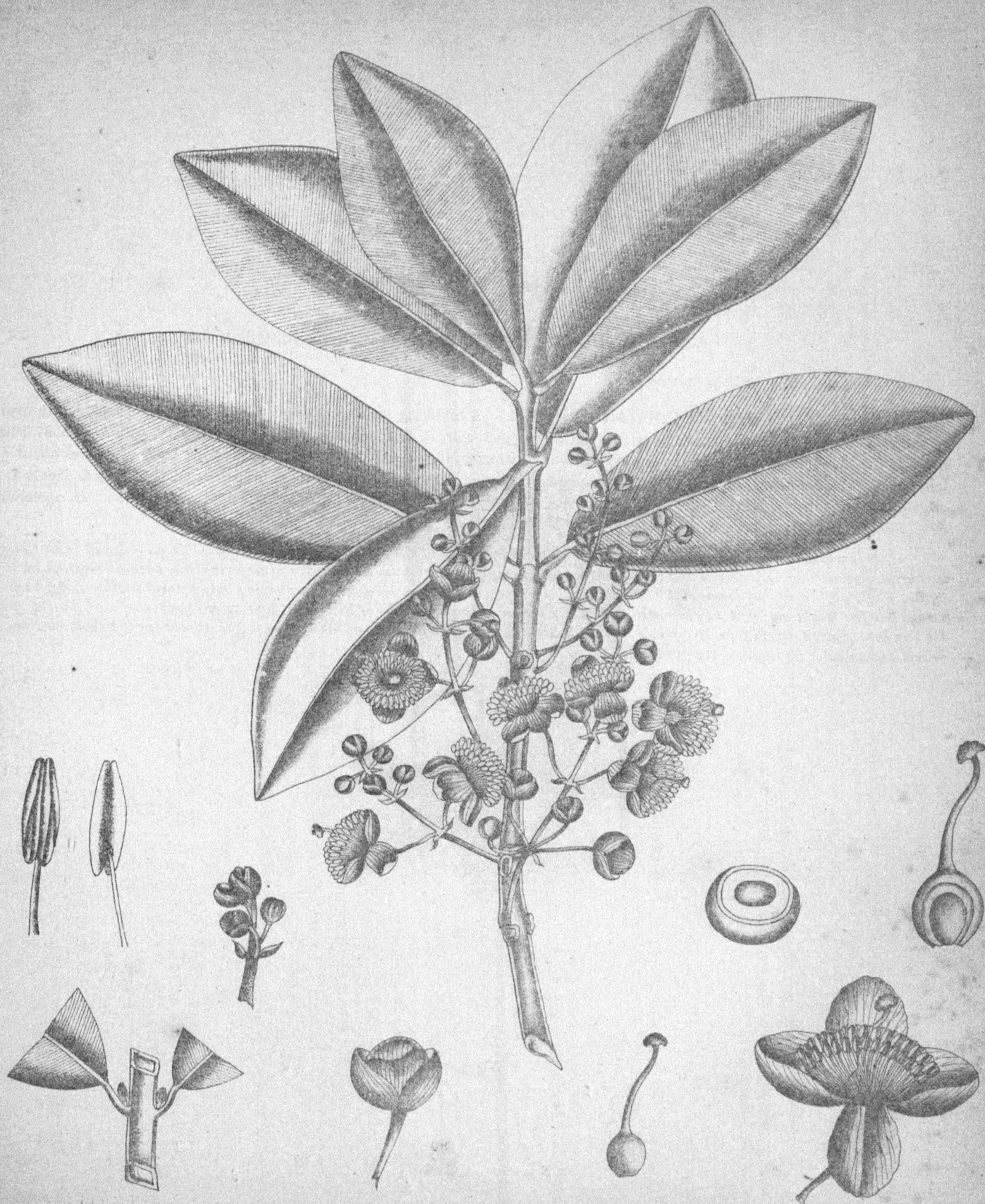
Govindoo, del: Ochrocarpus longifolius (Benth & Hook) Dumphey Lith.

CALOPHYLLUM WIGHTIANUM. (Nat. ord. Guttiferæ.)

For Gen. Char. see letter press to Pl. ii.

CALOPHYLLUM WIGHTIANUM. (Wall.) A middling sized tree, young shoots square glabrous, leaves oval obovate or rhomboid very obtuse at the apex, very firm coriaceous and shining 3-4 inches long by $1\frac{1}{4}$-$1\frac{1}{2}$ broad, petioles about 3 lines long, racemes few flowered shorter than the leaves, glabrous or when young slightly puberulous towards the base, peduncles about $\frac{1}{2}$ an inch long, rather slender furnished with a small boat shaped caducous puberulous bract at their insertions on the raceme, sepals 4, petals 0, stigma peltate entire. *Wall. Cat.* 4847. C. spurium, *Choisy in DC. Prod. vol.* 1. 562. C. caloboides, *G. Don.* C. apetalum, *Willd. Spr. Sys.* ii. 571. C. calaba, *L. in part.* C. decipiens, *Wight. Ill. p.* 128.

This tree is common near the banks of rivers on the western side of the Madras Presidency, and is called Kalpoon in S. Canara, where it is very common, and its timber is much esteemed; the specimens figured are from S.Canara, and unfortunately have no fruit, which is described by Dr. Wight as "small, oval, somewhat attenuated at both ends"; it was formerly described as having only 4 floral envelopes, viz. 4 sepals and no petals, but Dr. Wight says that he discovered 8. I have dissected a large quantity of buds and have never found more than 4; it is possible that the tree here figured differs from Dr. Wight's, but I believe it to be the apetalum of Willdenow. The timber is of a red color, very hard and heavy, and valuable for engineering purposes.



Alexs. del. Dumphy, Lith.

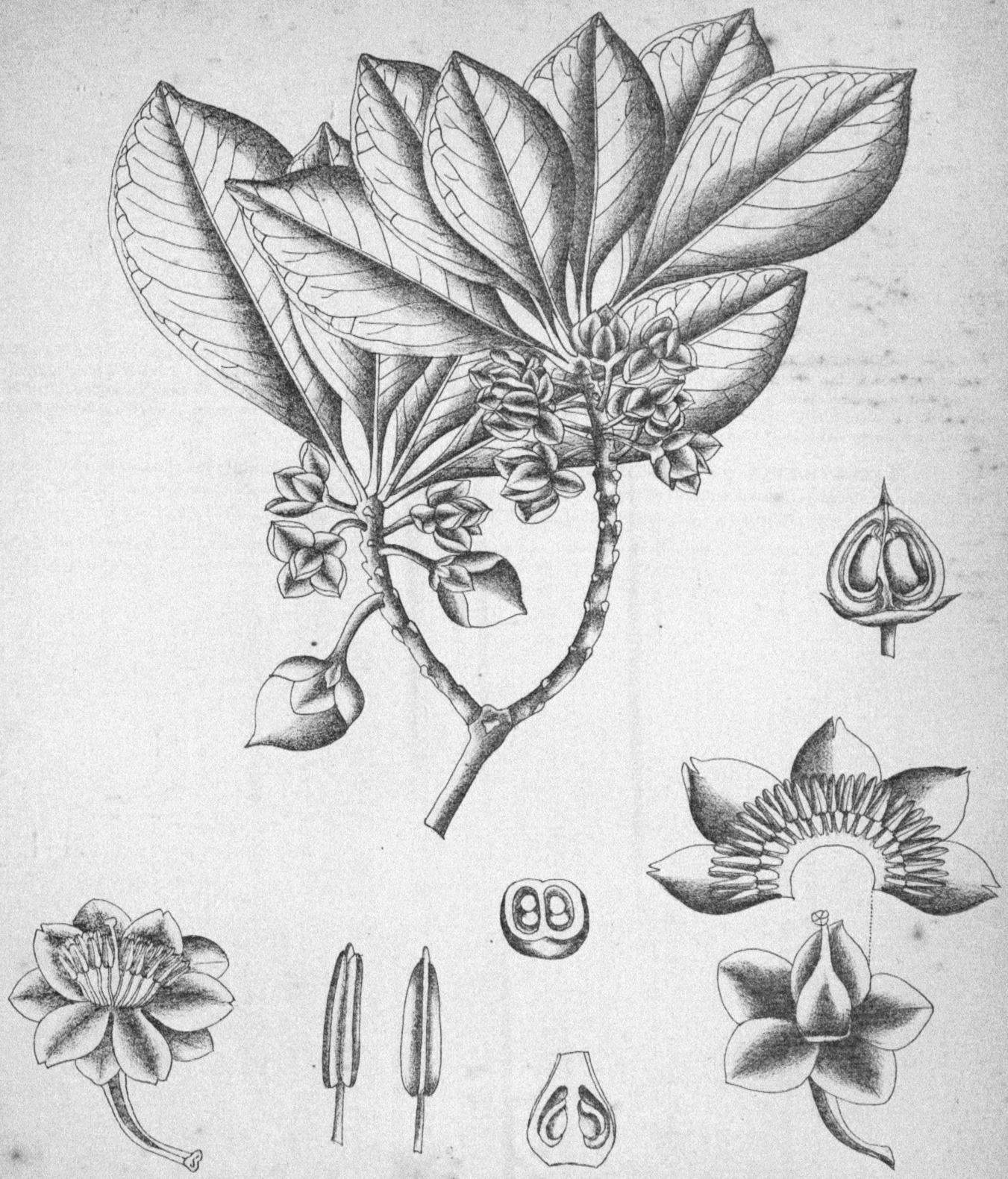
Calophyllum Wightianum, Wall.

TERNSTRÆMIA GYMNANTHERA. (Nat. ord. Ternstrœmiaceæ.)

TERNSTRÆMIA. *Linn.*—GEN. CHAR. Flowers usually hermathrodite, sepals 5 much imbricate, petals 5 imbricate united at the base, stamens numerous adnate to the base of the corol, anthers glabrous basifixed, cells adnate, ovary 2-3 celled with 1-4 ovules suspended from near the apex of each cell, style simple with a broadly 2-3 lobed stigma, fruit thick and indehiscent, but rather dry, seeds 2-few large, horseshoe-shaped inside, albumen fleshy often thin or scarcely any, embryo much curved or folded longitudinally. Trees or shrubs, leaves coriaceous, peduncles 1-flowered axillary or lateral curved downwards with 2 bracteoles close to the calyx.

TERNSTRÆMIA GYMNANTHERA. (WA.) A middling sized tree, glabrous, leaves cuneate-obovate, obtuse or shortly and obtusely pointed coriaceous entire, peduncles twice as long as the petioles, bracteoles persistent, anthers dotted with little points on the connective without bristles. Cleyera gymnanthera, *WA. Prod. p.* 87. Ternstræmia, *Benth. and Hook.*

A common tree on the Nilgiris and other elevated mountains on the west side of the Presidency, from an elevation of about 4,000 *feet upwards, also in Ceylon; called Kaymone on the Nilgilis. The wood is pinkish in color and much esteemed; it works well, but requires to be well seasoned; it is used for doors, rafters, and a variety of purposes.*



Alvaro, del

Ternstræmia gymnanthera (Wight)

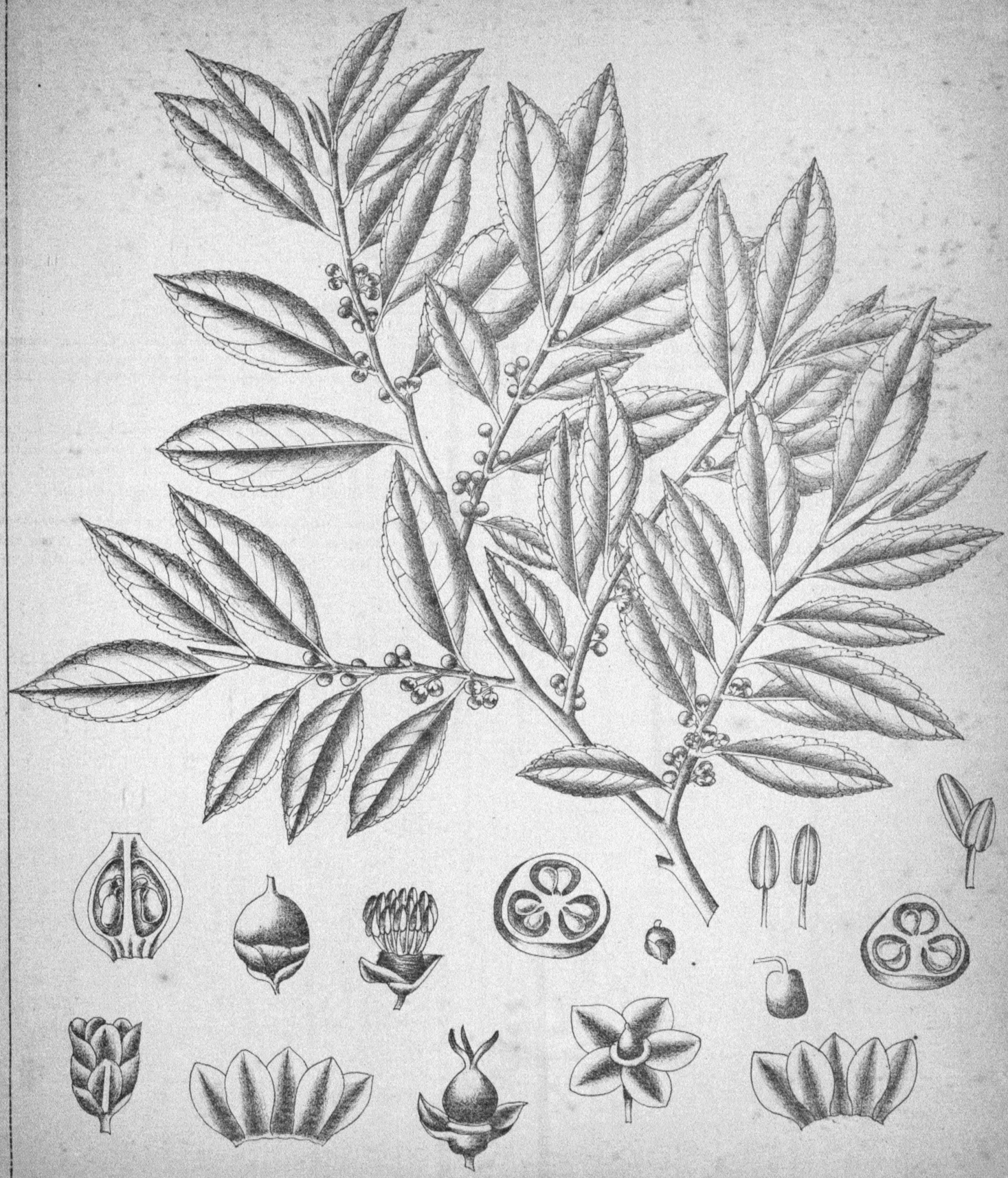
Dumphy, Lith.

EURYA JAPONICA. (Nat. ord. Ternstræmiaceæ.)

EURYA. *Thunb.*—GEN. CHAR. : Flowers mostly unisexual, sepals 5 much imbricate, petals 5 imbricate united at the base, stamens usually indefinite seldom above 15, anthers glabrous basifixed, cells aduate, ovary 3 (rarely 2-4-5) celled with several ovules in each, styles as many either almost free or united to near the top; fruit a berry, embryo much curved in a somewhat granular albumen. Trees or shrubs, flowers very small axillary, fascicled on short pedicels, or sessile.

EURYA JAPONICA. (Thunb.) A small tree, branches glabrous or pilose, leaves glabrous obovate or oblong 1½·2 inches long, slightly crenulate narrowed at the base, pedicels axillary usually 2-3 together 1-1½ lines long, flowers about 2 lines in diameter white, styles 3 distinct or united to near the apex. *Thunb. Fl. Jap.* 191, *t.* 25. Eurya Wightiana, *Wall.*;—*WA. Prod. p.* 86. E. fasciculata, *Wall.* E. tristyla, *WA. Prod. p.* 86. E. Ceylanica, *Wight Ill.* 1. 98. E. elliptica, membranacea et parviflora, *Gardner.*

Common on the western side of the Madras Presidency, principally on the mountains at the higher elevations, but also at low elevations, also in Ceylon and Northern India; called Hoolooni on the Nilgiris, and Neyadasse in Ceylon. Timber of a light chocolate brown; in leaf and general appearance it much resembles the tea plant, and I have seen it reared as such in tea plantations; there is only one species in this Presidency, but it is a very variable plant.



Govindoo, del.

Eurya Japonica, (Thunb.)

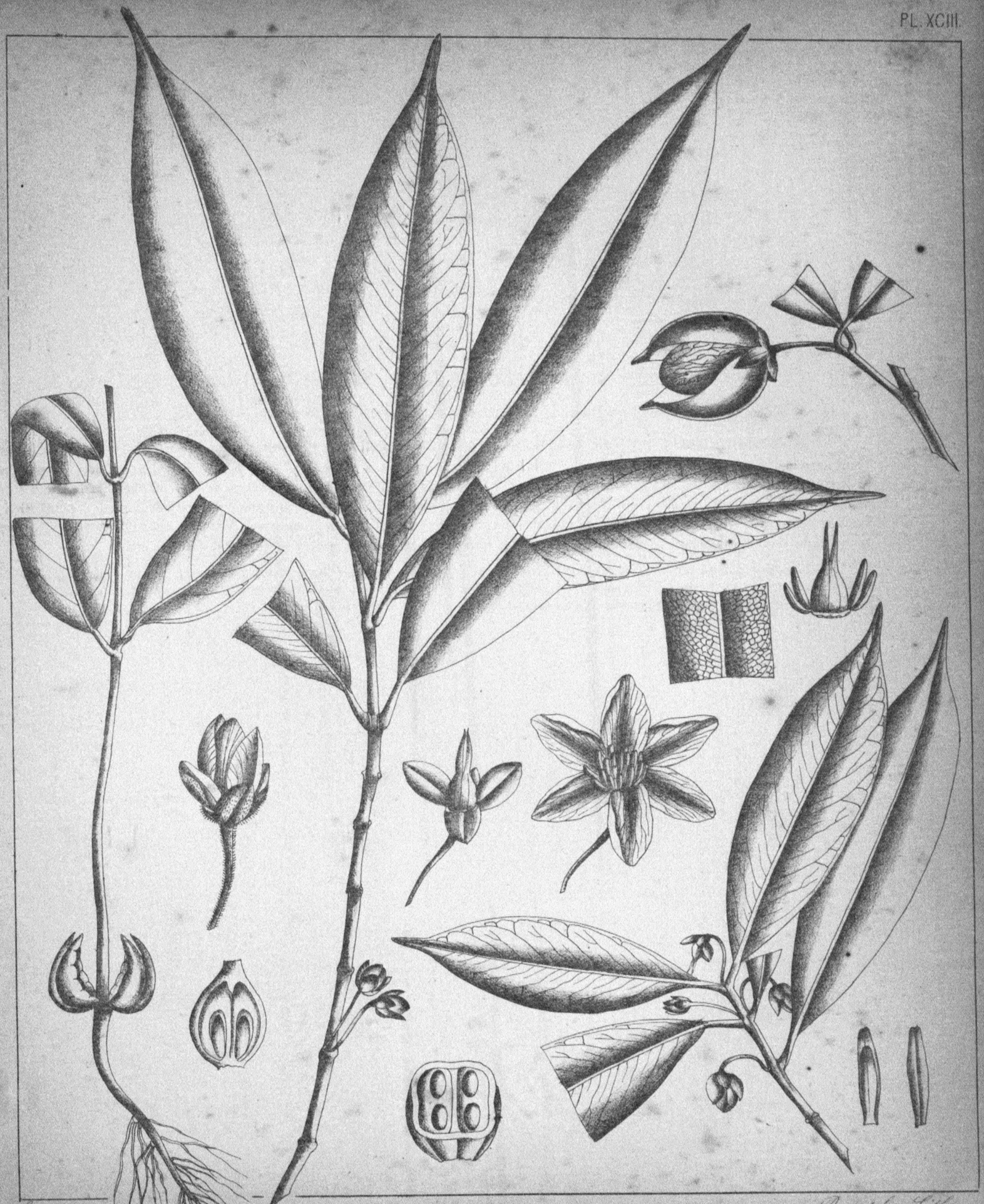
Dumphy, Lith.

PÆCILONEURON PAUCIFLORUM. (Nat. ord. Ternstræmiaceæ.)

For Gen. Char. see letter press to plate of P. Indicum, Pl. iii., and under the head of this genus in the Manual.

PÆCILONEURON PAUCIFLORUM. (Bedd.) A good sized tree, glabrous, leaves narrow lanceolate with a longish blunt acumination and attenuated at the base, 5-6 inches long by 1-1¼ broad, petioles 4-5 inch long, peduncles solitary or 2 together axillary or in the axils of the fallen leaves ½-¾ inch long, minutely puberulous, sepals 4 unequal puberulous on the outside, the 2 outer small, petals 6 imbricate, stamens 16-22 in two series inserted on to an evident disk below the ovary, styles 2, ovary 2 celled with 2 erect ovules in each cell, fruit globose pointed size of a large cherry dehiscent into 2 coriaceous valves, 1 celled, 1 seeded, seed hard round, testa loose membranaceous striated easily separable from the seed, cotyledons very large fleshy, albumen none.

Abundant on banks of rivers on the South Tinnevelly and Travancore mountains up to nearly 4,000 feet; called Pudangalli. It yields a valuable hard reddish timber, which is used for building and other purposes, and for walking sticks. In the plate a drawing is also given of a young seedling just after germination, showing the cotyledons and the loose testa attached.



Govindoo, del. Dumphy, Lith.

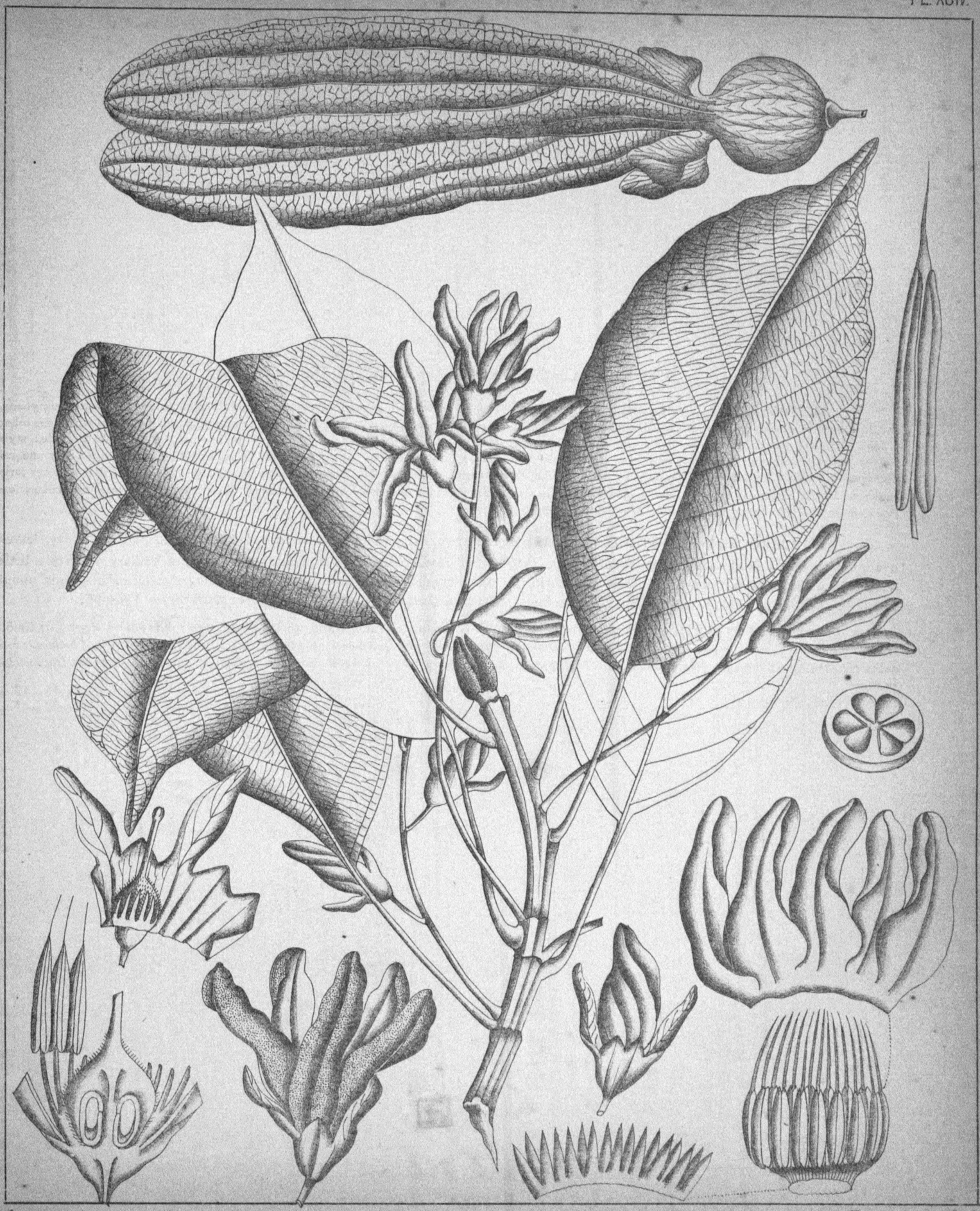
Porcloneuron pauciflorum. (Bedd.)

DIPTEROCARPUS INDICUS. (Nat. ord. Dipterocarpeæ.)

DIPTEROCARPUS. *Gærtn.*—GEN. CHAR. Tube of the calyx, when in flower free, divisions unequal slightly imbricate when very young, but soon open or subvalvate, tube of the calyx when in fruit enlarging and enclosing the fruit, 2 of the divisions expanding into long erect wings, the other 3 small, stamens numerous, anthers linear entire, valves equal, connective acuminate or produced into a long beak, ovary 3 colled, cells 2 ovuled, style filiform entire or obsoletely 3 toothed, capsule woody indehiscent 1 rarely 2 seeded enclosed on the enlarged calyx, cotyledons very large fleshy unequal corrugately lobed or contortuplicate, radicle superior. Lofty trees, bearing resin, stipules large enclosing the bud at the apex of the branches early caducous, leaves coriaceous entire or sinuato-dentate, parallely penniveined and transversely venulose between the veins, flowers large in axillary few flowered racemes (Pterygium, *Corr in Ann. Mus. Par.* viii. 397.)

DIPTEROCARPUS INDICUS. (Bedd.) A lofty tree, everywhere glabrous except the stipules petals and ovary, leaves ovato-oblong with a short acumination, about 5 inches long by 2½ broad, petioles 1½-2 inches long, racemes axillary solitary a little shorter than the leaves 5-8 flowered, petals puberulous on the outside, anthers terminated with a long slender bristle, fruit about 1 inch in diameter not ribbed, wings about 5 inches long. *Bedd. in Conservator of Forests Report (Madras) for* 1864-65.

Common in all the ghat forests from Canara down to Cape Comorin, very abundant in S. Canara, where it is called Guga; its timber is very open in the grain and not durable, but is occasionally used for various purposes; the tree yields a wood oil, but it is, I believe, never extracted; the liquid balsam, like Copaiba sold in Trevandrum, and the produce of a tree from those ghats is extracted from the Hardwickia pinnata.



Govindoo, del. Dipterocarpus Indicus (Bedd.) Dumphy, Lith.

VATICA ROXBURGHIANA. (Nat. ord. Dipterocarpeæ.)

VATICA. *Linn.*—GEN. CHAR. Tube of the calyx very small adnate to the torus or base of the ovary, not or scarcely enlarging when in fruit; divisions rather acute, when very young imbricate but soon open or pseudo-valvate, enlarging with the fruit, equal or unequal and patent. Stamens 15, anthers oblong or linear rarely ovate, connective generally with a short apiculation, ovary 3 celled, cells 2 ovuled, style short with a clavate apex, or long subulate, stigma entire or 3 toothed, capsule thick woody indehiscent, or 3 valved 1-2 seeded. Trees, bearing resin, stipules small fugacious or inconspicuous, leaves entire coriaceous penniveined and reticulato-venose, flowers in axillary or terminal panicles.

Sec. I. Isauxis.—Enlarged divisions of the calyx equal, patent below the fruit.

Sec. II. Euvatica.—Enlarged divisions of the calyx very unequal wing like, patent below the fruit.

The 2 Southern Indian species both belong to Isauxis.

VATICA ROXBURGHIANA. (Wight.) A large tree, young branches petioles and inflorescence minutely furfuraceous, leaves glabrous above except the costa, which with the costa and veins beneath is slightly scaly, ovate to oblong with an obtuse point rounded or obtuse at the base, furnished with 10-14 primary veins on each side, 4-8 inches long by 2-3¼ broad, petiole 1¼-2 inches long, panicles axillary shorter than the leaves, branchlets few flowered, calyx and outside of petals furfuraceous, divisions of the former acute enlarging in fruit and then 5 nerved and glabrescent, petals 5 times as long as the calyx, stamens 15 in 2 rows, anthers oblong with a short apiculation, style nearly double the length of the anthers, stigma clavate obscurely 3 or 6 lobed, fruit globose not sulcated crowned with a small nipple-like point at the apex, rough with minute raised reticulations and furfuraceous, hard woody and indehiscent. *Wight Ill. p.* 88.

Common in some of our western coast forests, particularly in the South Canara jungles, and planted in avenues, &c. in Travancore, also indigenous in Ceylon, where it is called Mendora; its timber is much valued in Ceylon, but I have not seen it in use in India; the tree produces a gum-resin.

Alvis, del.

Vatica Roxburghiana (Wight)

Dumphey, Lith.

HOPEA WIGHTIANA. (Nat. ord. Dipterocarpeæ.)

For Gen. Char. see under "H. parviflora," Pl. vi.

HOPEA WIGHTIANA. (Wall.) A large tree, young branches and petioles furnished with a dense short pubescence, leaves ovato-oblong, rounded at the base and attenuated towards the apex into a very obtuse point, glabrous on both sides except the costa above, primary veins distant 7-10 on each side of the costa, 6-9 inches long by 2-3 broad, petioles $\frac{1}{4}$-$\frac{1}{2}$ inch long, panicles glabrous axillary generally 3 together, shorter than or about the length of the leaves, flowers pink about $\frac{1}{2}$ an inch in length secund bracteolate at the base of their very short pedicels, calyx glabrous, corol hairy on the outside, stamens 15 alternately single and double, anthers terminated with a long bristle, fruit and calyx wings glabrous bright crimson colored, wings 2-2$\frac{1}{2}$ inches long by $\frac{1}{2}$ an inch broad, 7-9 nerved.—*Wall. L. N.* 6295 ;—*WA. Prod. p.* 85, and *Ill. tab.* 37—(wrong as to the 10 stamens.)

Vary. *β. glabra*, young branches and petioles glabrous or sub-glabrous. Hopea glabra, *WA. Prod. p.* 85.

This tree is very common in many of our western forests, an echinate excrescence, much like the young fruit of a Spanish chestnut, is often produced in the axils of the leaves ; it is probably the formation of some insect in the bud of the panicle, it is represented in the figure, a somewhat similar formation occurs in Hopea parviflora, as I have gathered specimens of the longer leaved variety in Tinnevelly with regular abortive panicles, several of the branchlets of each terminating with hard, round, warty, fruit-like excrescences 4 lines in diameter.

The timber is very valuable and very similar to that of Hopea parviflora. Variety β is the Kong of Tinnevelly, and is par excellence the timber of that district. I have not seen this more glabrous variety in fruit, but the flowers in no way differ from the ordinary form ; the latter is most abundant in the S. Canara district, where it is called Kalbow and Hiral bogi ; it is a first-rate coppice firewood, and large tracts in this state are met with in the plains of that district never apparently flowering, but abundantly covered with the abortive fruit-like excrescence.

Govindoo, del. Hoped. Wightiana. (Wall.) Dumphy, Lith.

ORDER XVI.—STERCULIACEÆ.

Flowers regular, hermaphrodite or unisexual. Calyx usually persistent, more or less deeply divided into 5 or rarely 4 or 3 valvate lobes or segments, or rarely splitting irregularly, or the sepals entirely free. Petals either 5, hypogynous, free, or adhering to the staminal column, contorted-imbricate in the bud, or small and scale-like, or none. Stamens usually united into a ring, a cup, or tube, with 5 terminal teeth or lobes (staminodia) alternating with the petals, and one or more anthers sessile or stipitate (on distinct filaments) in each interval, the anthers 2-celled and opening outwards, in longitudinal slits, or exceptionally the anthers are numerous or the staminodia wanting, or the stamens 5, free and alternate with the sepals or the anther-cells confluent or opening in terminal pores. Ovary free, 2 to 5-celled, with the carpels more or less united, rarely 10 or 12-celled, or reduced to a single carpel. Ovules 2-many in each cell, rarely solitary, affixed to the interior angle ascending or horizontal anatropal or amphitropal, raphe ventral or lateral micropyle inferior or rarely orthotropal. Style entire or divided into as many branches as there are cells, or rarely styles as many, nearly or quite free. Fruit various. Seeds sometimes hairy but not woolly, sometimes enveloped in pulp or strophiolate, the testa coriaceous, occasionally enclosed in an outer membranous integument, albumen fleshy or none ; cotyledons usually foliaceous, flat or folded, the radicle shorter, next the hilum or rarely distant from it. Herbs, shrubs, or trees, the tomentum or hairs stellate, rarely mixed with simple hairs. Leaves alternate or irregularly opposite, simple and pinnately or palmately nerved, entire toothed or lobed, or digitately compound. Stipules rarely wanting.

This order is represented in S. India by about 21 trees, viz., eight belonging to the genus Sterculia, one to Heritiera, one to Kleinhovia, seven to Pterospermum, two to Eriolœna, one to Abroma and one to Guazuma. The Guazuma, a naturalized tree from America, produces a good timber for furniture known as Bastard Cedar, and some of the Pterospermums yield good timber ; the Heritiera and the 2 Eriolœnas have very hard and tough wood, but the latter are very small. The Sterculias are some of them very ornamental trees for planting purposes, and the Sterculia villosa yields the Vakke nâr or valuable elephant rope fibre most useful to the forest officer in this country, and the Ster. guttata also yields a fibre scarcely inferior ; the Kleinhovia and Abroma are both very ornamental trees. The Cocoa (Theobroma) belongs to this order, and has been introduced into plantations on the western side of the Presidency, where it grows and fruits very well at an elevation of about 3,000 feet.

Tribe I, Sterculieæ.—Flowers unisexual or polygamous, calyx sometimes colored, petals 0, anthers 5-15 adnate crowded at the extremity of a long column or a short gynophore around the base of the ovary.

Anthers crowded into a head, seed albuminous	STERCULIA.
Anthers in a single row verticellate, albumen 0	HERITIERA.

Tribe II, Helictereæ.—Flowers hermathrodite, petals 5 deciduous, anthers 15, cells divergent alternating with small staminodia.

Anther cells divaricate, capsule membranaceous inflated	KLEINHOVIA.
Anther cells divaricate or confluent into one, fruit carpels spirally twisted	HELICTERES.
Anther cells parallel linear, fruit woody, seed winged	PTEROSPERMUM.

Tribe III, Eriolœneæ.—Flowers hermathrodite, petals deciduous, anthers numerous all fertile in many rows towards the apex of a conical tube or column ... ... ERIOLÆNA.

Tribe IV, Hermanieæ.—Flowers hermathrodite petals flat.

Stamens 5 distinct, staminodes 0, cotyledons entire	MELOCHIA.

Tribe V, Buettnerieæ.—Flowers hermathrodite, petals concave often with an appendage at the apex, anthers at the margins of a funnel shaped staminal tube between the staminodia.

Capsule membranaceous angled	ABROMA.
Capsule woody muricate	GUAZUMA.

STERCULIA. LINN.

For Gen. Char. see under letter press to plate of Sterculia guttata, Pl. cv.

1. STERCULIA GUTTATA.—For descr. see letter press to Pl. cv.

2. STERCULIA FŒTIDA, *Linn.* ; *DC. Prod.* i. 483.—A tall stout tree, glabrous, except the very young leaves. Leaves crowded at the ends of the thick branchlets, deciduous, digitately compound on long petioles ; leaflets 5 to 11, elliptical oblong or almost lanceolate, 4 to 8 inches long, mostly acuminate, entire, coriaceous, contracted into short petiolules. Flowers rather large, of a dull red, coming out with the young leaves in loose, simple or branched racemes, not exceeding the petioles. Calyx deeply divided into 5 lanceolate spreading segments, about ½ inch long, glabrous outside, tomentose inside. Staminal column or gynophore slender and curved, both in the males and females. Ovary very villous, 5-celled, with many ovules in each cell. Follicles large, woody, glabrous outside, fibrous within. Seeds 10 to 15, oblong, the radicle remote from the hilum. *R. Br. in Benn. Pl. Jav. Rar.* 227 ;—*Wight Ic. t.* 181 *and* 364.

A very handsome tree, well worthy of cultivation, found sparingly throughout the Presidency and in Mysore, Bombay, Bengal, Birmah and Ceylon ; it does not ascend the mountains, at least to any elevation ; it is called in Hindoostanee the Jungleebadam (or wild almond), the seeds being roasted and eaten like chesnuts. In Tamil it is called Peenaree, in Teligu Gurapu badam or horse almond, in Ceylon Telemboo, and in Birmah Letkohe ; a cubic foot of the wood unseasoned weighs 34 to 38 lbs., and when seasoned 28 lbs., and

its specific gravity is ·448. It is light, tough, and rather open grained, of a yellowish white color, easily worked, and not liable to split or warp; it is used for housebuilding and in the construction of canoes, and is adapted for packing cases, &c. Every part of the tree has a disagreeable smell when bruised; the leaves, bark, fruit and seeds are used medicinally by the natives.

3. STERCULIA BALANGHAS, *Linn.*—A middling sized tree, bark brown pretty smooth, leaves alternate about the extremities of the branchlets elliptic-oblong nearly glabrous on both sides entire 2-12 inches long, petioles about 1 inch long, panicles axillary generally solitary pendulous, peduncles and pedicels colored slender a little downy, flowers numerous small pendulous flesh-colored slightly fragrant; calyx campanulate hairy 5 parted, segments long slender, margins revolute converging at the points gaping wide at the sides; male, column of stamens recurved towards the apex crowded with minute anthers; hermathrodite, filaments numerous but very short, anthers fertile surrounding the base of the ovaries, ovaries 5 very hairy elevated on a receptacle surrounding a column which ends in a style, carpels (from 1 to 5 come to maturity) oval, seeds few affixed to the gaping sutures. *Roxb. Fl. Ind.* iii. *p.* 144. Cavalum, *Rheede. Mal.* ii. *t.* 49. Southwellia Balanghas, *Schott and Endl.*

I have only met with this tree in Travancore and in Ceylon, but it is also found in other parts of the western coast forests, and is often planted in gardens, &c. The seeds are roasted and eaten, and are nearly as palatable as chesnuts; the wood is not used as far as I know, it is open grained and soft. Cavalum is the native name for the tree in Malabar.

4. STERCULIA POPULIFOLIA, *Roxb.*—A large tree, leaves roundish cordate, acuminated entire membranaceous glabrous, racemes axillary peduncled branched shorter than the leaves, calyx-segments linear elongated revolute obtuse, ovary stalked, ovules numerous in each cell, carpels ovate ventricose terminated by a very short cultriform wing, long stalked glabrous, villous within. *Roxb. Fl. Ind.* iii. 148;—*Wi. Prod. p.* 62. Hildegardia populifolia, *Schott and End.*

A very handsome tree with scarlet flowers, found in the forests of the northern division of the Madras Presidency and in the Godavery forests, but I have not met with it on the western side of the Presidency. I am not acquainted with its timber.

5. STERCULIA COLORATA, *Roxb.*—A very large tree with an erect trunk, bark ash colored and a little scabrous, leaves villous alternate about the extremities of the branchlets, 5 lobed 5 nerved, the lobes acute 6-9 inches long by 9-12 inches broad, petioles about 9 inches long, stipules erect lanceolate, panicles terminal small numerous covered, as are the calyx and carpels, with brilliant red stellate pubescence, flowers about 1 inch long, calyx tube clavate, leathery 5 toothed at the apex, filaments scarcely any, anthers about 30 sessile round the border of the apex of the column, styles 5 short recurved, stigmas acute, carpels (from 1 to 5 come to maturity) pedicelled pendulous leathery opening long before the seeds are ripe, seeds generally 2 about the size of a field bean. *Roxb. Fl. Ind.* iii. 146. Firmiana colorata, *Br.* Erythropsis Roxburghiana, *Lindl.*

Not uncommon in the forests of the plains and about the foot of mountains throughout this Presidency, and in Mysore, Bombay, Bengal and Ceylon; it sheds its leaves in the cold weather, and is shortly afterwards covered with a mass of flowers, when it is a most beautiful object, appearing as if covered with numerous ramifications of red coral; it is called Karakà in Telegoo, and Khowsey and Bhaikoee on the Bombay ghats. I am not acquainted with its timber.

6. STERCULIA URENS, *Roxb.*—A large tree with a trunk of considerable girth, bark with very smooth leaves about the extremities of the branches alternate round cordate 5 lobed 5 nerved, lobes entire long finely pointed, 9 to 12 inches each way, very velvetty on the underside, nearly glabrous above, petioles about as long as the leaves downy, panicles terminal pretty large covered with a glutinous farinaceous yellow down, bractes lanceolate, flowers small numerous yellow, male and hermathrodite mixed, but the former more numerous, calyx campanulate 5 toothed leathery, segments acute with a hairy gland on the inside at the base, filaments 10 alternately longer united below into a thin sheath which encircles the receptacle of the ovaries, anthers large 2 lobed alternately larger, ovaries 5 on a thick short pedicel, style single short thick, stigma 5 lobed, carpels 5 united in the form of a star, covered with dense patent rigid stinging hairs, seeds 3 to 6 oblong chesnut colored. *Roxb. Fl. Ind.* iii. *p.* 145. Cavallium urens, *Schott and Endl.*

This tree is very common throughout the peninsula and in Ceylon, and may be seen in every forest, but does not ascend the mountains to any elevation; it is deciduous in the cold weather, and the flowers appear before the leaves; the wood is white and very soft, but native guitars and toys are sometimes made from it, and it is used for fuel. The tree yields a gum resembling Tragacanth, but not as valuable, the seeds are roasted and eaten and said to be cathartic, and a kind of coffee is made from them. The tree is called Thabsee in Teligu and Vellay Pootalee in Tamil.

7. STERCULIA VILLOSA, *Roxb.*—A middling sized or small tree, bark smooth, leaves alternate very downy particularly beneath, roundish or cordate lobate, 5 nerved, lobes 5-7 long pointed and lobate, from 12 to 18 inches each way, petioles round downy as long or longer than the leaves, stipules lanceolate-cordate downy caducous, panicles terminal the longer pendulous, the shorter drooping, every part covered with rust colored down, flowers numerous male and hermathrodite mixed, the former most numerous, all pretty large of a pale straw color and pink at the base of the calyx inside, bractes filiform caducous, calyx campanulate outside downy; hermathrodite, anthers 10 two lobed inserted on to the toothed edge of a membranaceous ring which surrounds the base of the ovaries, ovaries globular, style single, stigma 5 lobed, carpels 5 or fewer by abortion covered with rust colored down; male, the anthers are placed round 5 glands which represent the female organs. *Roxb. Fl. Ind.* iii. *p.* 153.

This tree is found throughout the Madras Presidency, and also in Bengal and Bombay; it is very common in the Anamallay forest, and is of great use to the Forest Department, as its bark yields a valuable fibre which is made into very strong ropes and used by the elephants to drag timber with; bags are also made from it. The tree is called Vake nár or Ance nár in Tamil, which latter means elephant fibre. The timber is not of any value; good paper has been made from the fibre.

8. STERCULIA ALATA, *Roxb.*—A very large tree up to 100 feet high, trunk straight, up to 10 feet in girth, bark smooth ash colored, leaves alternate about the ends of the branchlets cordate entire smooth 3-5 nerved, 4-12 inches long by 3-8 broad, petioles round smooth 1-4 inches long, stipules minute subulate early caducous, racemes axillary or terminal about as long as the petioles, sub-

panicled, clothed with ferruginous stellate pubescence, flowers pretty large short pedicelled reflexed male and female on the same racemes, bractes ensiform 3 under each flower early caducous, calyx campanulate divided nearly to the base into 5 thick fleshy recurved lanceolate segments clothed with ferruginous stellate pubescence on the outside, inside striated with crimson and yellow ; male, staminal column cylindric straight much shorter than the calyx, anthers subsessile imbricated in 5 fascicles of about 5 each, which unite below the middle and form a cup round the 5 rudimentary ovaries ; female, column wanting, staminodia in 5 sessile bundles embracing the 5 grooves of the base of the ovaries, ovaries 5 each semi-ovate, styles short recurved villous, stigmas broad and emarginate, carpels very large, nearly round, 3-5 inches in diameter, long peduncled, seeds numerous oblong compressed each terminating in a long broad spongy wing which is thin and submembranaceous at the apex. *Roxb. Fl. Ind.* iii. 152. Pterygota alata, *Br.* Pterygota Roxburghii, *Schott et Endl.*

A very handsome ramous tree, deciduous in February and March when it flowers ; it is found on the Cuttack mountains and in Eastern Bengal and Ceylon, but I have never seen it in the southern part of this Presidency ; in Sylhet it is called Toola, and the seeds are said to be eaten as a cheap substitute for opium. I know nothing of its timber.

HERITIERA. Ait.

Gen. Char. : Flowers unisexual, calyx 5 toothed or 5 cleft, petals 0, staminal column slender bearing on the outside below the summit a ring of 5 anthers with parallel cells, ovaries 5 nearly distinct 1 ovulate, style short with 5 rather thick stigmas, fruit carpels woody indehiscent keeled or almost winged on the back, seeds without albumen, cotyledons very thick, the radicle next the hilum. Trees, leaves undivided coriaceous scurfy underneath penninerved, flowers small in axillary panicles.

1. Heritiera littoralis, *Ait.*—A tree attaining a considerable size, leaves very short petiolate oval or oblong, the larger ones fully 8 inches by 4, but often much smaller, quite entire coriaceous glabrous above, silvery underneath with a close scaly tomentum, flowers small numerous, in loose tomentose panicles in the upper axils much shorter than the leaves, calyx about 2 lines long, staminal column in the males, pistil in the females much shorter than the calyx, fruit carpels sessile ovoid 2-3 inches long thick and almost woody with a slightly projecting inner edge and a strong projecting almost winged keel along the outer edge. *Benth. in Fl. Austral.* Nagam, *Rheede.* 6 *t.* 21. Balanopteris Tothila, *Gærtn. fr.* 2. *t.* 99.

This tree is found about the sea coast throughout India, Ceylon and Birmah, and extends to Australia and Africa ; it is called Sundri in Hindustani, Kanazoe in Birmah, and Attoona in Ceylon ; the wood is strong, fibrous and flexible, tolerably close and straight grained, not very durable, of a light red color turning to reddish brown, and not easily worked ; a cubic foot unseasoned weighs from 75 to 80 lbs., and when seasoned 64 lbs.; its specific gravity is 1·024. It is used for poles and shafts of carriages, and spokes of wheels, and makes excellent firewood.

Analysis of this genus will be shortly given.

KLEINHOVIA. Linn.

Gen. Char. : Bractlets small, sepals 5 deciduous, petals unequal the upper ones with a long stalk, margins involute at the base, column elongate adherent to the gynophore expanding above into a bell-shaped cup which is divided into 5 subdivisions each bearing 3 anthers, anther cells divergent, ovary stalked concealed within the cup of the anthers 5 lobed 5 celled with 3-4 ovules in each cell, style slender, capsule pyriform membranous distended 5 lobed loculicidally 5 valved, seeds 1-2 in each cell globose tubercled exalbuminous, cotyledons spirally twisted, radicle next the hilum. A tree with entire leaves and rosy flowers in loose panicles.

Kleinhovia hospita, *Linn.*—An ornamental middling sized tree, leaves cordate ovate subacuminate entire palmately 3-5 ribbed smooth 2-4 inches long by 2-3 broad, petioles about 1 inch long, flowers pinkish slightly fragrant numerous arranged in much-branched spreading cymes ; pedicels downy jointed, calyx 5 parted, segments revolute, petals 5 tubular unequal in size, column curved dilated above into a campanulate cup which divides into 5 phalanges of 3 stamens each without any intermediate staminodes, fruit pyriform bladdery 5 lobed 5 winged, seeds 2 or 3 in each cell roundish tuberculate. *Oliver Fl. Af.* 1. 226.

This very ornamental tree is common in a cultivated state throughout the peninsula, but I have never observed it in any of our forests. I am not acquainted with the timber.

Analysis of Genera, Pl. IV, fig. 4.

Kleinhovia hospita—1 full flower, 2 stamen tube and ovary, 3 stamens and staminodia, 4 ovary cut transversely, showing also position of stamens and staminodia. (Drawn by Dr. Thwaites.)

HELICTERES. Linn.

Gen. Char. : Calyx tubular, 5-cleft at the top, often oblique. Petals 5, equal or the 2 upper ones broader, the claws elongated, and all or two of them often with a lateral appendage. Staminal column adnate to the gynophore, truncate at the top, or more frequently bearing 5 teeth or small lobes (staminodia) with 1 or 2 stipitate anthers between each, anther cells divaricate, often confluent into one. Ovary nearly sessile on the top of the staminal column, 5-lobed, 5-celled, with several ovules in each cell. Styles 5, subulate more or less connate slightly thickened and stigmatic at the top. Fruit carpels distinct or separating, opening along their inner edge, straight or spirally twisted. Seeds with little albumen, cotyledons leafy folded round the radicle. Trees or shrubs, with stellate or branched tomentum. Leaves entire, serrate or obscurely lobed. Flowers axillary, solitary or clustered. Bracteoles none or distant from the calyx, capsules usually tomentose, the clusters of tomentum often forming long woolly processes. The appendages on the claws of the petals appear to vary in different flowers of the same species.—Methorium, *Schott.*

1. Helicteres Isora, *Linn.* ; *Dc. Prod.* i. 475.—A shrub with a rather rough stellate pubescence. Leaves on short petioles, broadly obovate or orbicular, often oblique, irregularly toothed or the lower ones obscurely 3 lobed, mostly about 4 inches long, scabrous above, more or less tomentose underneath or sprinkled with short stellate hairs. Pedicels short, usually 2 or 3 together. Calyx ½ inch long

This very ornamental flowering tree is common in gardens, but has been introduced from Java.

Analysis of Genera, Pl. V, fig 3.

Melochia velutina—1, full flower ; 1*a*. a petal ; 2, a flower, petals removed, showing the 5 stamens ; 3 ovary and styles; 4, a young fruit ; 5, fruit cut transversely ; 6, anther front and back view.

ABROMA. Jacq.

Gen. Char. : Calyx 5 parted, petals 5 saccate at the base with a large oblong deciduous unguiculate appendage, staminal tube a 5 lobed urceolus, lobes petaloid obcordate curved outwards alternate with the petals, stamens in the sinuses united into 5 filaments each bearing 2-4 anthers, cells divaricate, ovary sessile 5 celled, cells many ovuled, styles 5 short connivent, capsule ovoid membranaceous 5 celled with 5 prominent angles, each cell dehiscing above, seeds numerous albuminous, embryo straight, cotyledons plane cordate, radicle near the hilum. Small trees, with stellate pubescence, leaves cordate angled or lobed, flowers showy purple.

Abroma angusta, *Linn.*—A small ornamental tree, branches velvetty, leaves ovate-oblong to roundish cordate 3-5 angled acuminate serrulate, under side tomentose or more or less scabrous with stellate pubescence, 8-10 inches long by 4-6 broad, petioles ½-¾ inch long, peduncles leaf-opposed, wings of the fruit truncated at the apex with the exterior angle somewhat acute. *WA. Prod. p.* 63 ;—*Roxb. Fl. Ind.* iii. *p.* 156.

A small ornamental tree, indigenous in the interior of the peninsula and often met with in gardens ; it flowers abundantly in the rains and the seeds ripen in the cold season. The bark abounds with strong white fibres which make a good hemp ; the tree grows rapidly and yields annually several crops fit for peeling. To prepare the fibre the bark is steeped in water for about a week, beyond which it requires no further clearing, and in this state is stronger than the hemp of the Crotalaria juncea (*San*), and not liable to become weakened by exposure to wet. The tree is very easy of culture and grows well almost anywhere in the plains.

Analysis of Genera, Pl. V, fig. 4.

Abroma angusta—1, a flower bud shut ; 2, the same with the calyx opened out, showing the concave dilated claws at the base of the petals ; 3, a petal ; 4, stamen tube ; 5, the same opened, inside view, and the ovary and styles ; 6, a young fruit.

GUAZUMA. Plum.

For Gen. Char. see letter press to Pl. cvii.

Guazuma tomentosa.—For description, &c., see Pl. cvii.

ORDER XVII.—TILIACEÆ.

Flowers regular, hermathrodite or rarely unisexual. Sepals 5, rarely 3 or 4, free or more or less cohering, usually valvate Petals as many or fewer or none, alternate with the sepals, inserted round the base of the torus. Stamens indefinite, rarely reduced to very few, inserted on the torus, which is often raised or disk-like. Filaments free or slightly united at the base. Anthers 2-celled, with parallel or rarely divaricate cells opening in longitudinal slits or in terminal pores. Ovary free sessile 2-or more celled. Style simple and entire, or divided at the top into as many stigmatic teeth or lobes as there are cells. Ovules 1, 2, or more in each cell, erect, pendulous, or horizontal. Fruit capsular or indehiscent, with single-or several-seeded cells, where several-seeded the cells often subdivided by spurious vertical or transverse partitions. Seeds without any arillus, the testa usually coriaceous or crustaceous. Albumen fleshy, rarely deficient. Embryo straight or rarely curved or slightly folded. Cotyledons leafy or rarely fleshy, the radicle next to the hilum, usually shorter than the cotyledons. Trees, shrubs or rarely herbs. Leaves alternate or very rarely opposite, simple with pinnate or palmate nerves, entire, toothed, or rarely lobed. Stipules usually free, and small or deciduous. Flowers axillary, terminal or leaf-opposed, usually in little cymes, often almost umbellate, either solitary and sessile or pedunculate, or arranged in panicles.

Pityranthe verrucosa and Berrya Ammonilla are Ceylon trees ; the latter, which has been introduced into this Presidency, yields the Trincomalee wood. Erinocarpus Nimmonii is a tree found on the Bombay ghats ; the genus Grewia is largely represented, yielding about 18 *species. G. tiliæfolia is a large tree yielding a valuable timber, and C. abutilifolia, salvifolia, Asiatica and lævigata grow to small trees ; but all the other species are only shrubs. Leptonychia,* 1 *small tree ; Elæocarpus is represented by* 11 *trees, some of which yield very good timber ; the timber of most of these latter is unknown, and is well worthy the attention of forest officers.*

Tribe I, Brownlowieæ.—Sepals combined into a 3-5 fid campanulate calyx, anthers small globose, lobes sometimes confluent at the apex.

5 interior stamens sterile	Pityranthe.
Stamens all fertile	Berrya.

Tribe II, Grewieæ.—Sepals distinct, petals glandular at the base internally, torus elongated, anthers subglobose or short, lobes parallel.

Fruit unarmed glabrous or tomentose, stamens numerous free all fertile	Grewia.
Fruit unarmed glabrous or tomentose, stamens 10 monadelphous with 5 staminodia, one between each pair of stamens	Leptonychia
Fruit echinate	Erinocarpus.

Tribe III, Elæocarpeæ.—Anthers linear dehiscing at the apex, petals inserted round the base of the antheriferous glandulose elevated torus ... ... Elæocarpus.

PITYRANTHE. Thw.

For Gen. Char. see letter press to Pl. cix.

1. Pityranthe verrucosa, *Thw.*—For description, &c., see Pl. cix.

BERRYA. Roxb.

For Gen. Char. see letter press to Pl. lviii.

1. Berrya Ammonilla, *Roxb.*—For description, &c., see Pl. lviii

GREWIA. Linn.

For Gen. Char. see letter press to Pl. cviii.

1. Grewia tiliæfolia, *Vahl.*—For description, &c., see Pl. cviii.

2. Grewia Asiatica, *L.*—A small tree, leaves 5 nerved, roundish-cordate obtuse or acutish sometimes unequal at the base unequally serrated, upper side at length nearly glabrous under side glabrous pubescent or hoary 4-5 inches long by 3-4 broad, stipules lanceolate subulate 1 nerved ½ as long as the petiole, peduncles axillary 2-4, or opposite the leaves, twice or thrice as long as the petiole 3 flowered and as well as the petioles divaricating, sepals oblong-lanceolate twice the length of the narrow obovate petals, torus scarcely longer than the glands, style about equal to the stamens, stigma 4 lobed, drupes globose with 1-2 one-celled nuts. *WA. Prod. p.* 79. Grewia subinæqualis, *DC. Prod.* 1. 511.

A small tree or large shrub common throughout India, called in Hindustani Phálsá ; the fruit is eaten by the natives ; it is also found in Africa.

3. Grewia lævigata, *Vahl.*—A small tree, with subglabrous branches, leaves on very short petioles oval tapering or rounded at the base, very gradually attenuated at the apex into a long narrow acumination, serrated except at the base, 3 nerved at the base prominently arcuate venose beneath, in age quite glabrous above slightly hairy on the veins beneath, 2-8 inches long by 1-3 broad, stipules about 3 lines long with a long narrow point, peduncles solitary axillary or 2-3 together, 2 or 3 times longer than the petioles 2-3 flowered, bractes conform to the stipules much shorter than the pedicels, sepals linear narrow 3-4 times longer than the oblong entire bluntish petals, torus short, drupe deeply 2 lobed, lobes the size of small peas glabrous, nuts 1-2 in each lobe, 1-2 celled. *DC. Prod.* 1. 510. G. didyma, *Roxb Fl. Ind.* ii. 591.

A small tree not uncommon throughout the Madras Presidency; found also in Africa.

4. Grewia salvifolia, *Heyne.*—A small tree or shrub, the younger branches, petioles and pedicels covered with ferruginous or pale down, petioles about ¼ inch long dilated at the apex, stipules subulate acuminate longer than the petioles, leaves obliquely subcordate oblong or lanceolate sharply serrate or subentire, 3-costate, arcuate-venose, nearly glabrous above cinereo-tomentose below, peduncles axillary or terminal, solitary or twin about the same length as the petiole, and dividing into 3 pedicels, flower buds cylindrical oblong, flowers ½ inch in diameter, sepals oblong obtuse cinereo-tomentose, nerves prominent, petals notched shorter than the stamens, ovary pubescent, drupes 1-2 lobed, lobes globose the size of a small pea thinly covered with short bristly hairs, at length glabrous and each containing a bony 4 celled nut, seeds 1 in each cell. *Heyne in Roth. Nov. Sp. p.* 239 ;—*WA. Prod. p.* 77 ;—*Roxb. Fl. Ind.* ii. 587. Grewia Rothii, *DC. Prod.* 1. 509 ;—*WA. Prod. p.* 78. Grewia bicolor, *Roth.*

A small tree, common in many parts of the Madras Presidency, particularly in the Northern Circars, where it is called Jàrà ; the leaves are very white beneath ; it is found also in Africa.

5. Grewia abutilifolia, *Juss.*—A small tree, leaves 3 nerved roundish-cordate sometimes with a few sharpish lobes, irregularly and coarsely toothed, upper side rough under harshly tomentose, peduncles several together axillary about ½ as long as the petiole 3-4 flowered, sepals oblong about thrice the length of the oblong entire petals, torus scarcely longer than the glands, style about the length of the stamens, drupes 4 lobed, pubescent and hairy when ripe sometimes nearly glabrous, nuts 4 or fewer by abortion 1-2 celled. *Juss. in Ann. Mus.* 4. *p.* 92 ;—*WA. Prod. p.* 79. Grewia aspera, *Roxb. Fl. Ind.* ii. 590.

A small tree, common in many parts of the Madras Presidency ; in the Circars it is called in Telugu Pedda tarraki.

The following species of this genus are found in Southern India, but are never more than small shrubs.

6. Grewia Orientalis, *L.*; *WA. Prod. p.* 76.
7. Do. bracteata, *Roth.*; *WA. Prod. p.* 76.
8. Do. columnaris, *Sm.* ; *WA. Prod. p.* 76.
9. Do. helicterifolia, *Wall.*—In Tinnevelly and Ceylon. *Walps. Rep.* ii. 799.
10. Do. pilosa, *Lam.* ; *WA. Prod. p.* 78.
11. Do. hirsuta, *Vahl.*; *WA. Prod. p.* 78.
12. Do. emarginata, *WA. Prod. p.* 79.
13. Do. villosa, *WA. Prod. p.* 79.
14. Do. rotundifolia, *Juss.* ; *WA. Prod. p.* 80.
15. Do. populifolia, *Vahl.* ; *WA. Prod. p.* 80.
16. Do. microcos, *Linn.* ; *WA. Prod. p.* 81.
17. Do. diplocarpa, *Thw. En. Pl. Zey. p.* 31.—Ceylon. I have also an undescribed species from South Canara, with oblongo-ovate very suddenly pointed asperous leaves, and axillary or supra-axillary long stalked umbelled heads each containing 25-30 flowers. (Grewia umbellifera, *Bedd*).

LEPTONYCHIA. Turcz.

For Gen. Char. see letter press to Pl. cxiv.

Leptonychia Moacurroides, *Bedd.*—For description, &c., see Pl. cxiv.

ERINOCARPUS. Nimmo.

For Gen. Char. see letter press to Pl. cx.

1. Erinocarpus Nimmonii, *Grah.*—For description, &c., see Pl. cx.

ELÆOCARPUS. Linn.

For Gen. Char. see letter press to Pl. cxi.

1. Elæocarpus amænus, *Thw.*—For description, &c., see Pl. cxi.

2. Elæocarpus serratus, *Linn.*—A large tree, leaves petioled alternate ell iptical obtuse bluntly serrated, nerves with gland in their axils and at most of their subdivisions, petioles with a small gland on each sic le near the apex, racemes simple from the axils o the leaves and scarcely so long, stamens 20-30, exterior anther valve bearded with a 3-5 small hairs, ovary 3 celled, ovaries 2 in each cell, drupes oblong, nut oblong very hard indehiscent prominently tubercled 1 celled 1 seeded. *Linn. Sp. Pl. p.* 734 ;—*WA. Prod. p.* 82.

A common tree in all our western forests and in Ceylon ; the wood is worthy of attention ; the fleshy exterior of the fruit is eaten ; the tree is called Weeralu in Ceylon.

3. Elæocarpus oblongus, *Gærtn.*—A large tree, leaves petioled a alternate elliptic oblong with blunt and often shallow serratures, nerves with glands in some of the axils or often without any, petiole s with a small gland on each side near the apex, racemes simple from the axils of the fallen leaves and considerably shorter than the lea ves, stamens 30-40, anther valves naked, ovary sessile 3-celled, cells 2 ovuled, drupes oblong, nut oblong very hard indehiscent prom inently tubercled 1 celled 1 seeded. *Gærtn. fr. t.* 43 ;—*WA. Prod p.* 82. Perin-kara, *Rheede Mal.* 4. *t.* 24.

Malabar, Nilgiris, Anamallays and western forests generally, but not extending to Ceylon ; it is called Bikki by the Burghers on the Nilgiris, where the wood is much esteemed ; it is white, strong and tough, and adapted for the lathe.

4. Elæocarpus montanus, *Thw.*—A middling sized tree, leaves ovate or rotundate obtuse denticulate sparingly hirsute (younger ones tomentose beneath), the primary veins furnished with co nspicuous glands in their axils, 2-3½ inches long, petiole ½-1 inch long, racemes axillary equalling the leaves tomentose, anthers naked, ovary 3 celled, cells 2 ovuled, drupe spherical. *Thw. En. Pl. Zey. p.* 32.

Ceylon, on the higher mountains.

5. Elæocarpus coriaceus, *Hooker.*—A middling sized tree, leaves coriaceous glabrous very obtuse above, somewhat cuneate downwards, slightly serrated on the margin, occasionally so mewhat cordate at the base, glands in the axils of the veins, racemes axillary, flowers drooping, sepals lanceolate tomentose, anthers naked, ovary 3 celled and surrounded by glands, cells 2 ovuled, drupe globose, putamen ruguloso-tuberculate. *Hook. Ic. Plant. v.* 2. *t.* 154. E. obovatus, *Arnt.* (not *Don.*)

Ceylon, on the higher mountains.

6. Elæocarpus cuniatus, *Wight.*—A middling sized tree, leaves cuneate obovate, terminating in a short obtuse acumen tapering below into the petiole, anthers bearded, hairs at length reflexed, ovary 3 celled elevated on a prominent torus, thickly clothed with white hairs, cells 2 ovuled. *Wight. Ill. p.* 83.

Quilon.

7. Elæocarpus subvillosus, *Arnt.*—A middling sized small tree, leaves subcoriaceous broadly ovate or obovate crenatoserrate, glandular beneath, the younger ones pubescent above, tomentose beneath, at length nearly glabrous on both sides, 4-5 inches long by 2-2½ broad, petioles 1-1¼ inches long tomentose, racemes tomentose axillary or from the axils of the fallen leaves as long or a little longer than the leaves, flowers short pedicelled, pedicels and bracts hairy, anthers 20-25, cells villous naked at the apex or rarely with 2-3 small hairs on the exterior valve, ovary villose, 3 celled, cells 2 ovuled, drupe oblong, putamen tuberculate acute at the apex. *Arnt. Pug. v.* 323. E. pubescens, *Hooker Ic. Pl.* ii. *t.* 155.

Ceylon, Saffragram district up to 2,000 feet elevation.

8. Elæocarpus ferrugineus, *Wight.*—For description, &c., see Pl. cxii.

9. Elæocarpus tuberculatus, *Roxb.*—For description, &c., see Pl. cxiii.

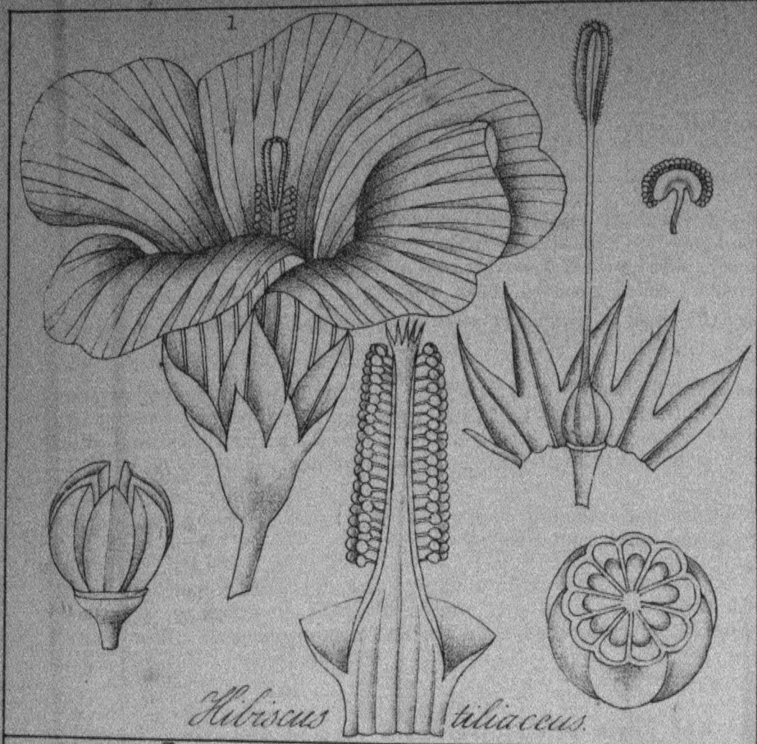
10. Elæocarpus glandulifera, *Hooker.*—A large tree, leaves ovate lanceolate, somewhat undulated on the margin, crenately serrated glabrous, with or without saccate glands in the axils of the nerves beneath, racemes axillary from a little shorter to about the length of the leaves many flowered, flowers drooping short pedicelled, sepals lanceolate acute, petals pubescent not involute on the margins, anthers furnished with a few hairs at the apex which are at length reflexed, ovary elevated on a torus very hairy 2 celled, cells with several ovules, drupe oval size of an olive. *Hooker MS.* ;—*Wight. Ill. p.* 84. Monocera Munronii, *Wight. Ill. p.* 84.

A very large handsome tree, abundant in Coorg, the Wynad, Nilgiris, and throughout our western forests, from an elevation of about 2,500 feet up to 6,000, also in Ceylon. On the Nilgiris it is called Kal bikki by the Burghers, and the timber (which much resembles that of E. oblongus) is much esteemed ; it is whitish, with a brown heart.

Elæocarpus ganitrus, *Roxb.*—A good sized tree, leaves short petioled lanceolate serrulate when very young slightly sericeous at length glabrous on both sides, about 6 inches long by 1½ broad, stipules minute conical caducous, racemes from the axils of fallen leaves, a little shorter than the leaves, flowers white drooping, each with a solitary bract at the pedicel, and 2 below the calyx, oblong, villous, with the anterior margin dentate very early caducous, sepals lanceolate acute the length of the petals slightly villous on both sides one ribbed on the inside, petals somewhat villous, filaments about 40, anther cells sometimes furnished with a few distinct hairs at the apex, ovary 5 celled with about 4 ovules in each cell attached to the upper end of the axis, style longer than the stamens 5 grooved, stigma simple small acute, drupe globose smooth size of a large cherry of a deep purple, putamen tuberculate and marked with 5 equidistant deep grooves, seeds 1 or 2. *Roxb. Fl. Ind.* ii. *p.* 592. Ganitrus sphærica, *Gærtn. Sem.* 2. *p.* 271. *t.* 139.

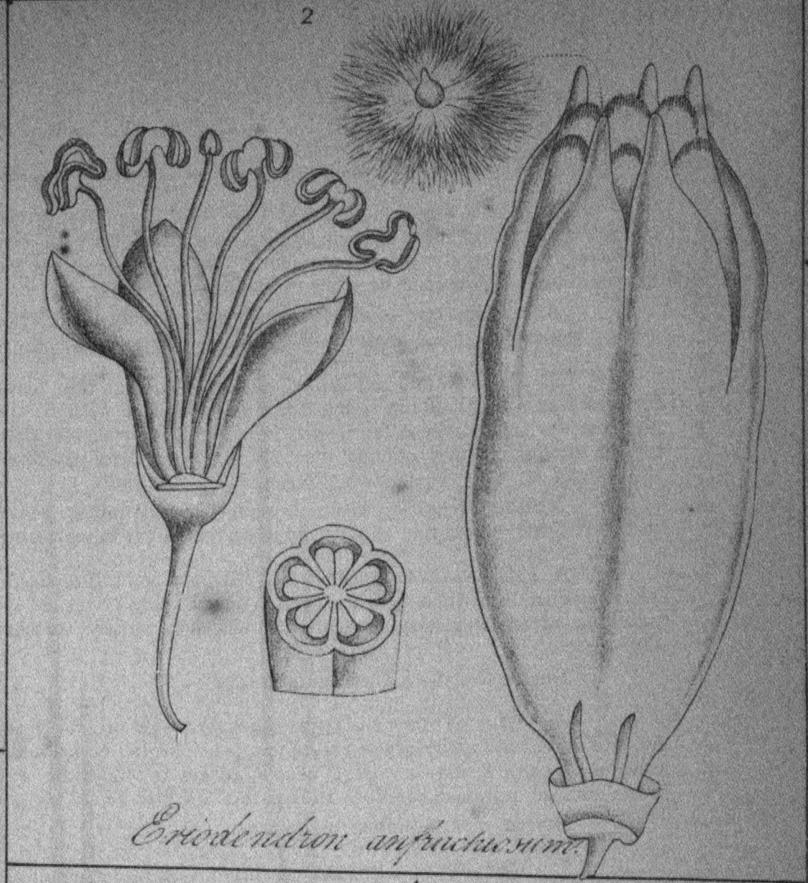
This tree is found on the Canara ghats and in the Bombay Presidency, in Northern India ; and in the Malay Archipelago it is called Roodrack by the natives, a name given generally to most of the Elæocarps ; and the seeds of this and several other species are worn as beads by Fakeers, and are often set in gold as bracelets, &c., as European ornaments. This genus is abundantly represented in the forests in Northern India, in Java, Birmah, the Malay Peninsula, and Australia, and there are upwards of 50 species known.

Malvacea

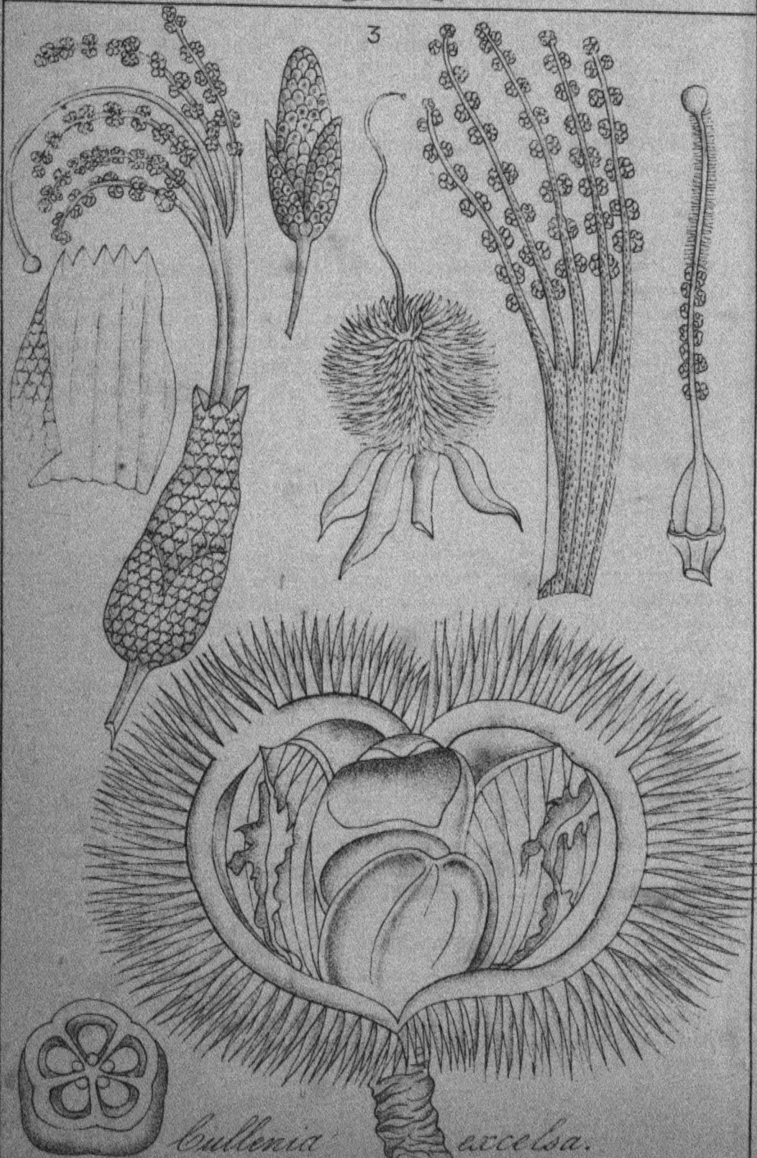


Hibiscus tiliaceus.

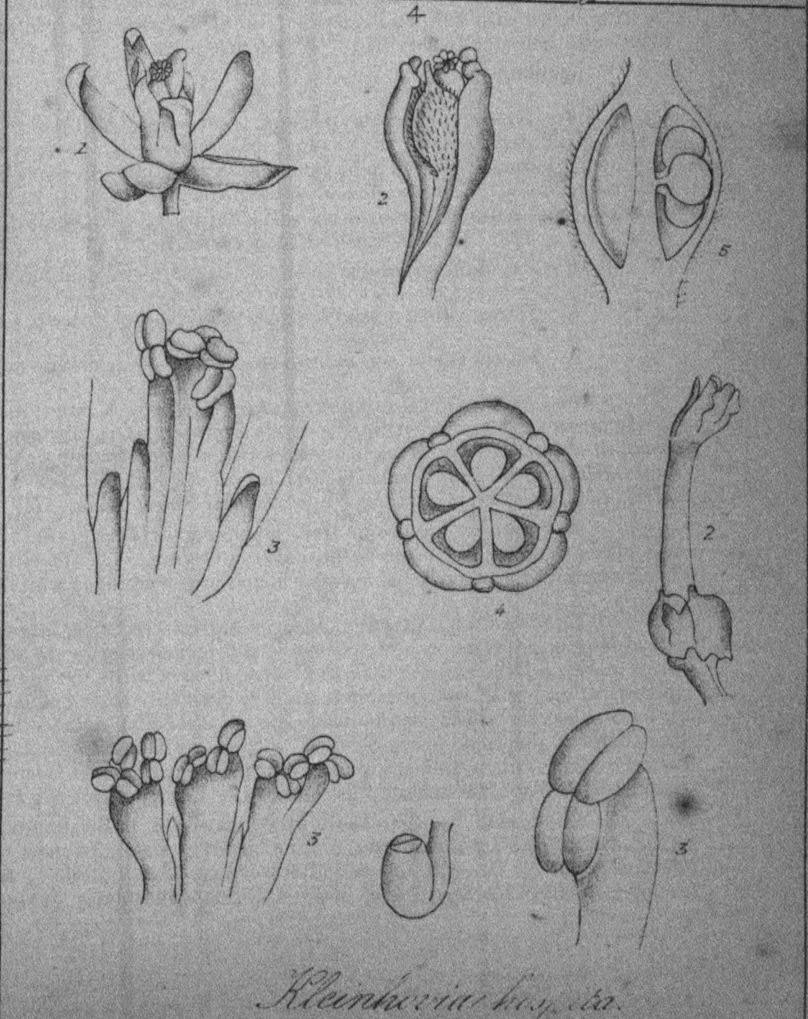
Sterculiacea



Eriodendron anfractuosum.

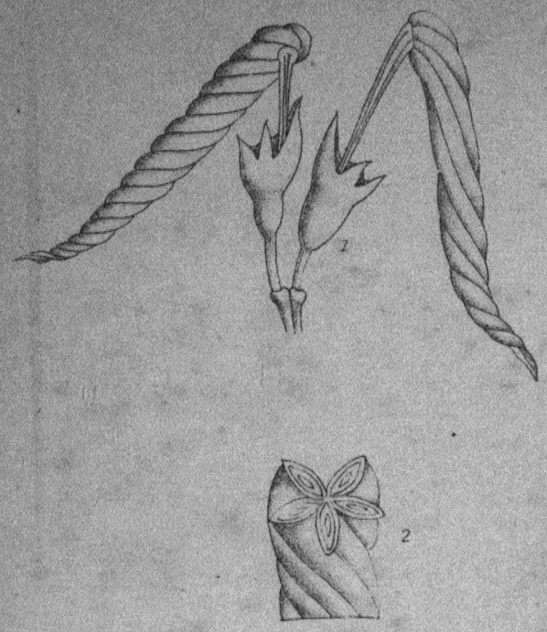


Cullenia excelsa.

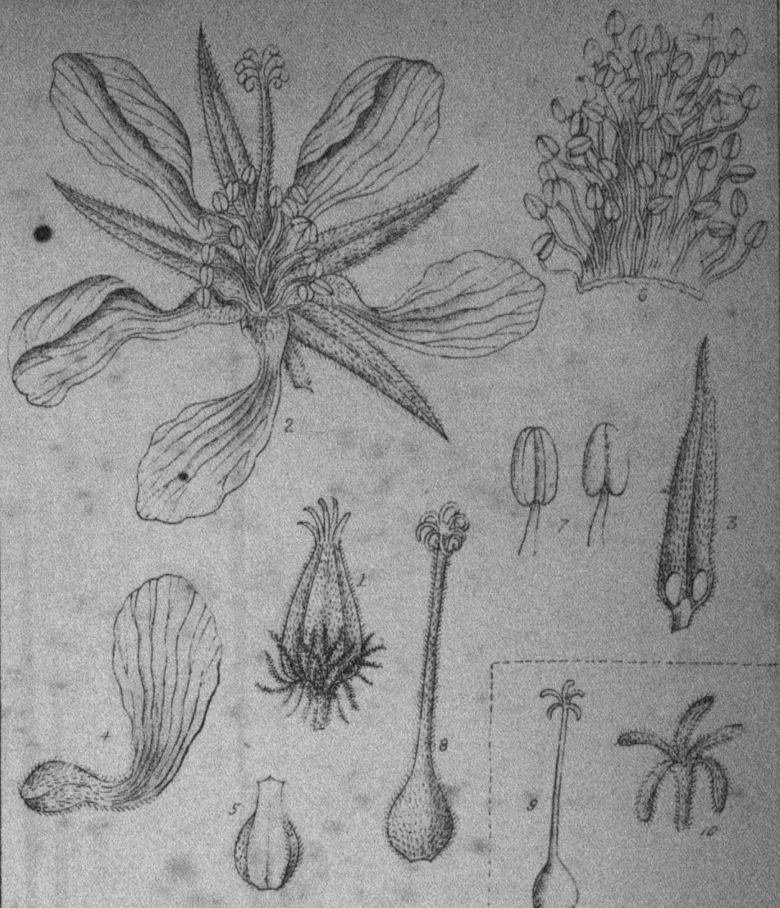


Kleinhovia hospita.

Gwynne del. Dumphy Lith.

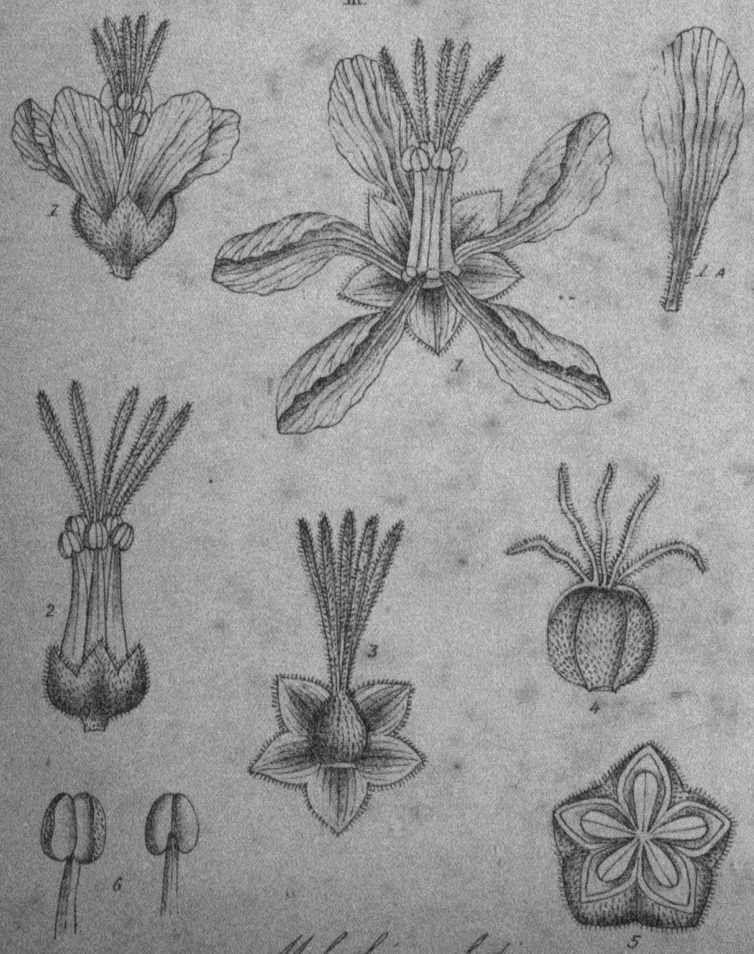


Helicteres Isora.



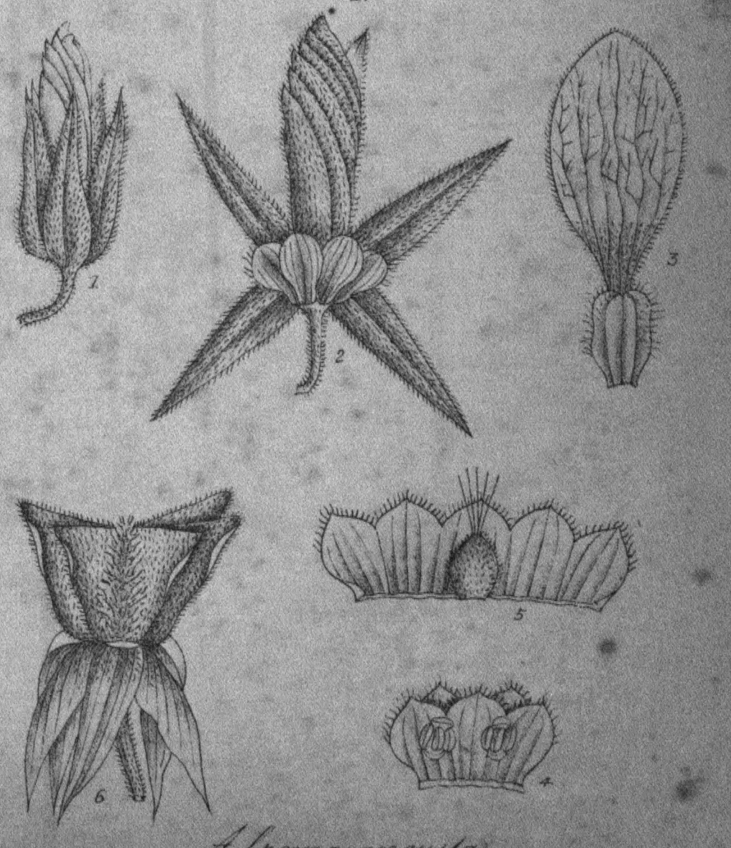
Eriolæna Hookeriana. E. quinquelocularis.

III.



Melochia velutina.

IV



Abroma angusta.

Gozzaldo del. Dumbey Lith.

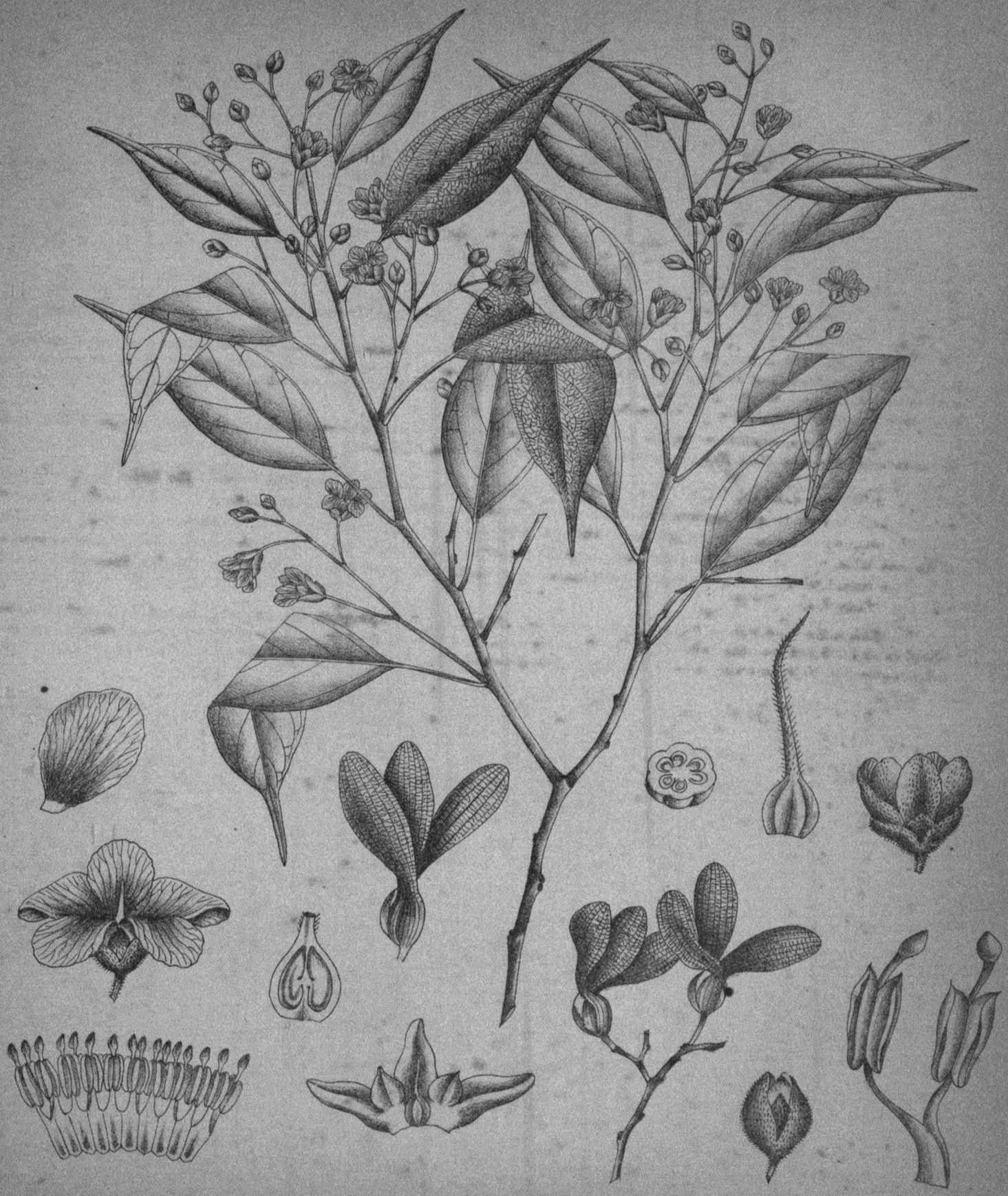
DOONA ZEYLANICA. (Nat. ord. Dipterocarpeæ.)

DOONA. *Thw.*—GEN. CHAR. Tube of the calyx in flower very short adnate to the torus, divisions imbricate, in fruit the tube not enlarging, 3 of the divisions enlarging into large erect wings ; 3 small, all connivent at the base round the fruit, stamens 15, anthers oblong with the cells equal, connective produced into a terminal process, ovary 3 celled, cells 2 ovuled, style subulate, stigma small, fruit indehiscent generally 1 seeded, seed ovoid, cotyledons extremely contortuplicate, radicle superior.

Glabrous trees, resiniferous, stipules small deciduous or inconspicuous, leaves entire coriaceous penninerved, panicles axillary or terminal, flowers rather small.—*Thw. Hook. Kew. Journ.* iv. *p.* 7 ;—*Benth. and Hook. Gen. Pl. p.* 193.

DOONA ZEYLANICA. (Thw.) A lofty tree, trunk straight, much branched towards the upper part, bark rough and cracked, branches terete and smooth, leaves penniveined with numerous intermediate reticulations lanceolate dark-green above, paler beneath, rounded at the base, tapering towards the apex into a rather long acumination with an abrupt point, 2-2¼ inches long by ¾ of an inch wide, petioles ½ inch long grooved along the upper surface, panicles furnished with small brown deciduous bractes, calyx pale-green tinged with red, the 3 enlarged leaves becoming a deeper red, petals pale rose darker at the tips, filaments united about ½ way up. *Thw. l. c.*

This is the famous Doon tree of Ceylon, called also shingle tree by the planters; it is very abundant in the Central Provinces of that island up to 4,000 *feet elevation, and the timber is highly prized for building purposes and for shingles; the tree yields a large quantity of colorless gum-resin from its trunk and branches, which when dissolved in spirits of wine or turpentine makes an excellent varnish.*



Vaonnitoo del.

Doona Zeylanica (Thw.)

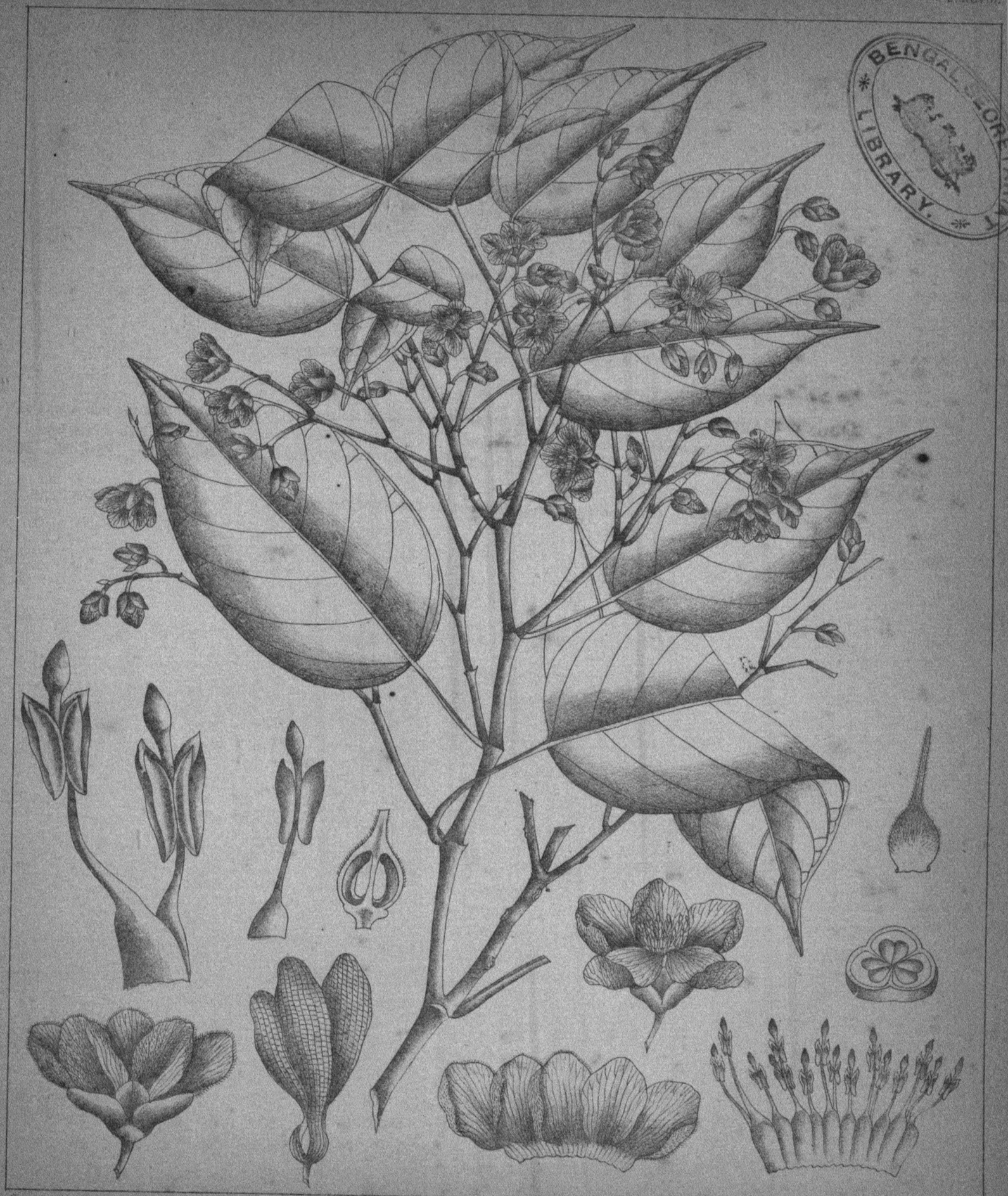
Dunsky Lith.

DOONA GARDNERI. (Nat. ord. Dipterocarpeæ.)

For Gen. Char. see letter press to Pl. xcvii.

DOONA GARDNERI. (Thw.) A lofty tree, leaves ovate or ovato-lanceolate, rounded at the base tapering into a longish point at the apex, 2-3½ inches long by 1½-2 inches broad, petioles about ¾-1 inch long, flowers drooping about ½ an inch across, bractes small early caducous, calyx minutely puberulous or at length glabrous, corol densely pubescent on the outside. *Thw. En. Pl. Zey. p.* 35.

This beautiful tree is found in the Central Provinces of Ceylon at 3,000 *to* 5,000 *feet elevation.*



BENGAL HORTICULTURAL LIBRARY.

Grimdon del.

Dioscorea Gardneri (Hook.)

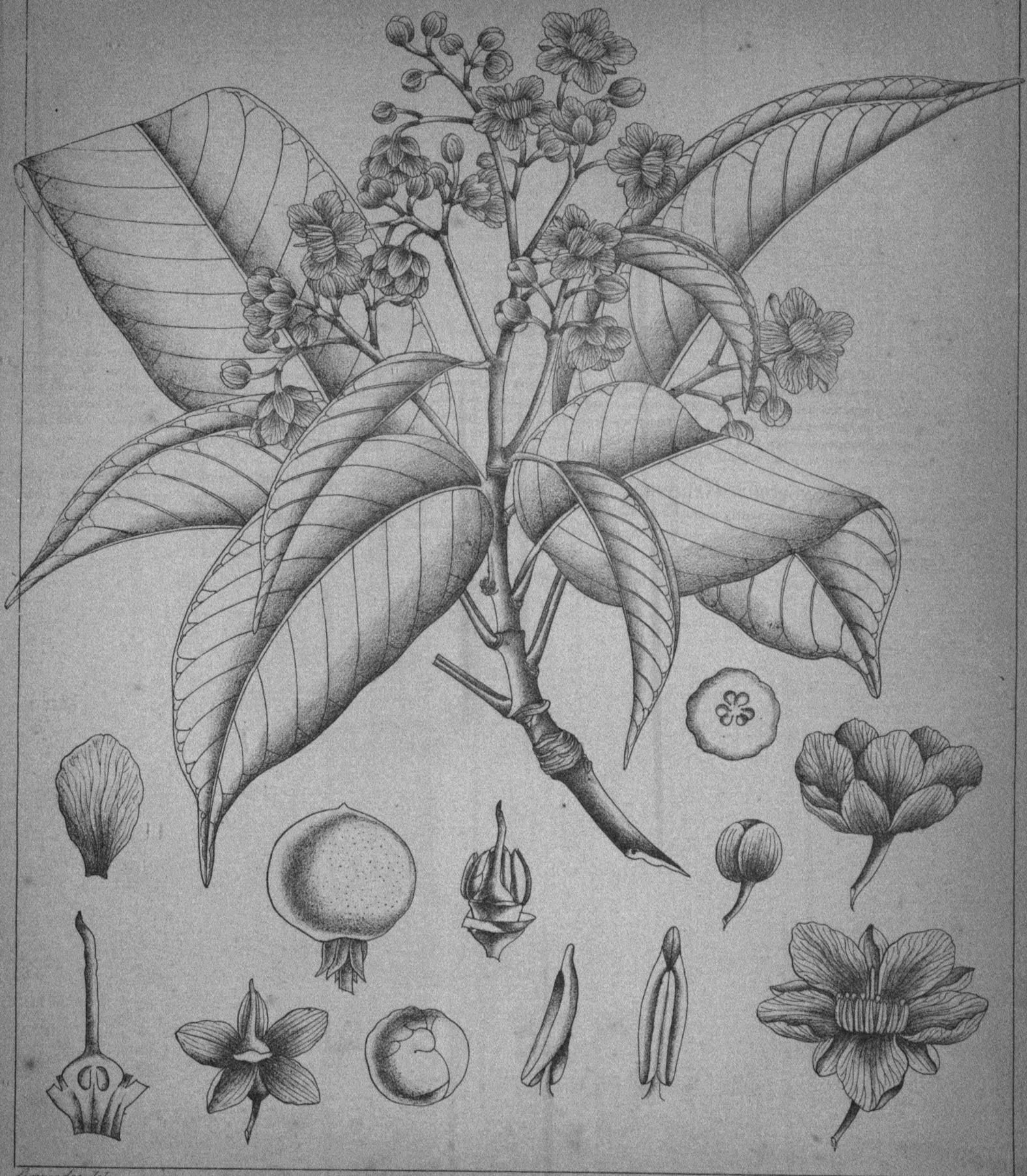
Dampier, Lith.

STEMONOPORUS GARDNERI. (Nat. ord. Dipterocarpeæ.)

STEMONOPORUS. *Thw.*—GEN. CHAR. Calyx 5 parted, divisions equal not enlarging in fruit, petals 5 equal, æstivation convolute, stamens 15 in 2 series, 5 interior and 10 exterior, monadelphous on a short ring round the base of the ovary, anthers oblong introrse dehiscing by a pore at the apex, connective not produced beyond the anther, ovary 3 celled, cells 2 ovuled, ovules pendulous from the apex of the axis anatropal, style filiform, stigma simple, fruit spherical ¾-1 inch in diameter with the calyx reflexed beneath it, 1 celled by abortion, irregularly dehiscing, testa membranaceous, embryo exalbuminous, cotyledons thick plicato-convolute. Trees like Vateria, but differing in their fewer anthers arranged only in 2 series. *Thw. Hook. Journ. of Bot. Vol.* vi. *p.* 3. Vateria *(in part) Benth. and Hook. Gen. Pl. p.* 194. Vatica *(in part) DC. Prod.* xvi. *p.* 620.

STEMONOPORUS GARDNERI. (Thw.) A large forest tree, leaves oblong-lanceolate or ovate acuminate, rounded at the base or subcordate, prominently veined beneath, 3¼-6 inches long by 1½-2¼ broad, petioles about 1 inch long, panicles slightly hoary numerous at the apex of the branchlets, more or less elongate 4-12 flowered, pedicels 3-4 lines long, flowers about ¾ inch across in expansion. *Thw. l. c. and En. Pl. Zey. p.* 38.

Ceylon, in the Central Provinces at about 5,000 *feet elevation.*



Gourdon del.

Stemonoporus Gardneri (Thw.)

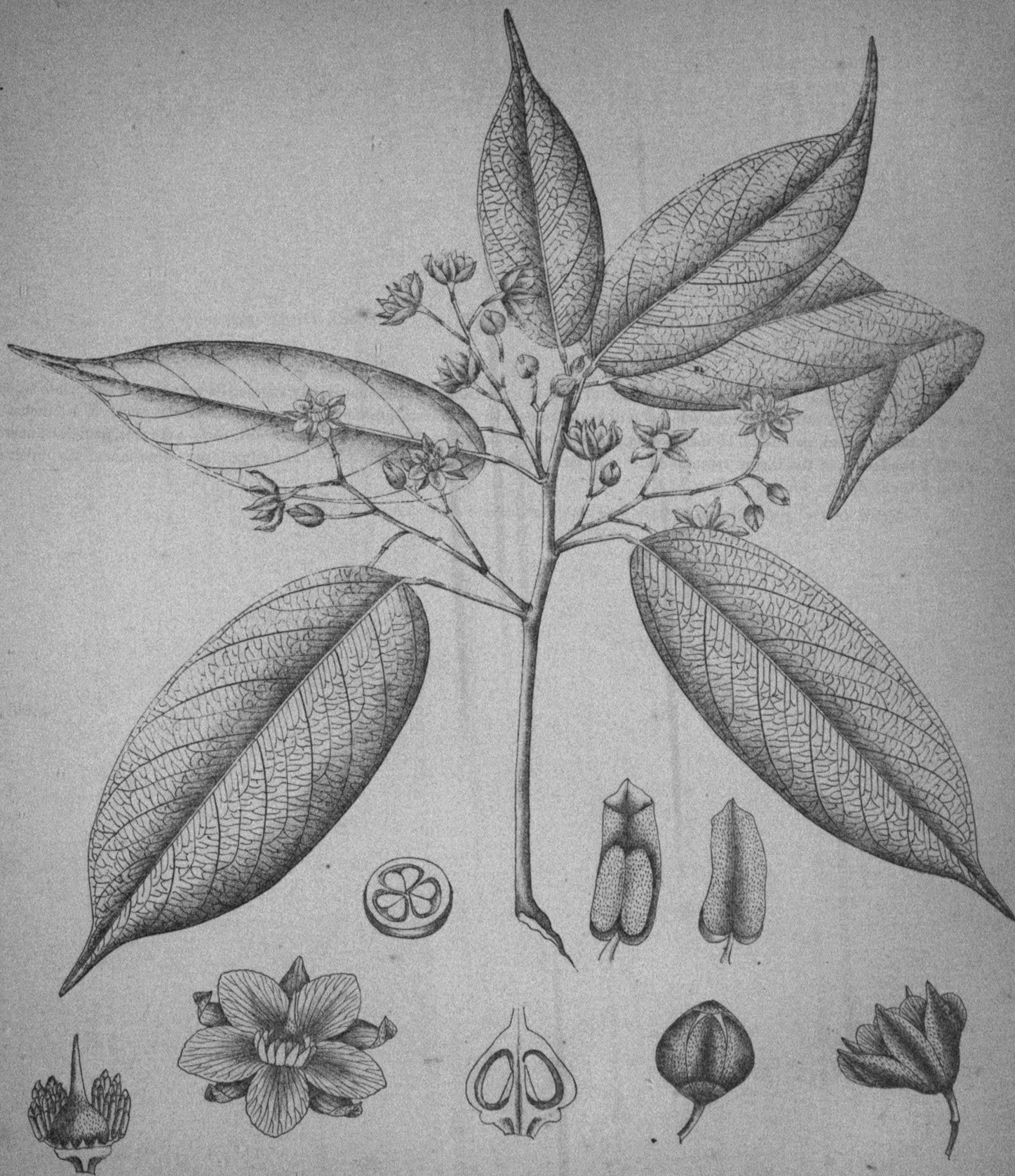
Dempsey Lith.

STEMONOPORUS ACUMINATUS. (Nat. ord. Dipterocarpeæ.)

For Gen. Char. see letter press to Pl. xcix.

STEMONOPORUS ACUMINATUS. (Thw.) A large tree, branches moderately rugose, leaves narrow lanceolate to oblong lanceolate gradually attenuated into a long blunt point, rounded at the base, prominently veined and reticulato-venose, 4-7 inches long by $\frac{3}{4}$-2 inches broad, petioles $\frac{3}{4}$-$1\frac{1}{2}$ inches long, stipules falcato-lanceolate 3 lines long $\frac{1}{2}$ line broad, early caducous, panicles puberulous about $\frac{1}{2}$ the length of the leaves, racemiform or moderately ramous, bractes minute deciduous, calyx lobes ovato-lanceolate puberulous. *Thw. En. Pl. Zey. p.* 403.

Ceylon, in the Ambagamwa, Badulla and Mahamahanewera districts at no great elevation.



Govindoo Beth.

Dancky Lith.

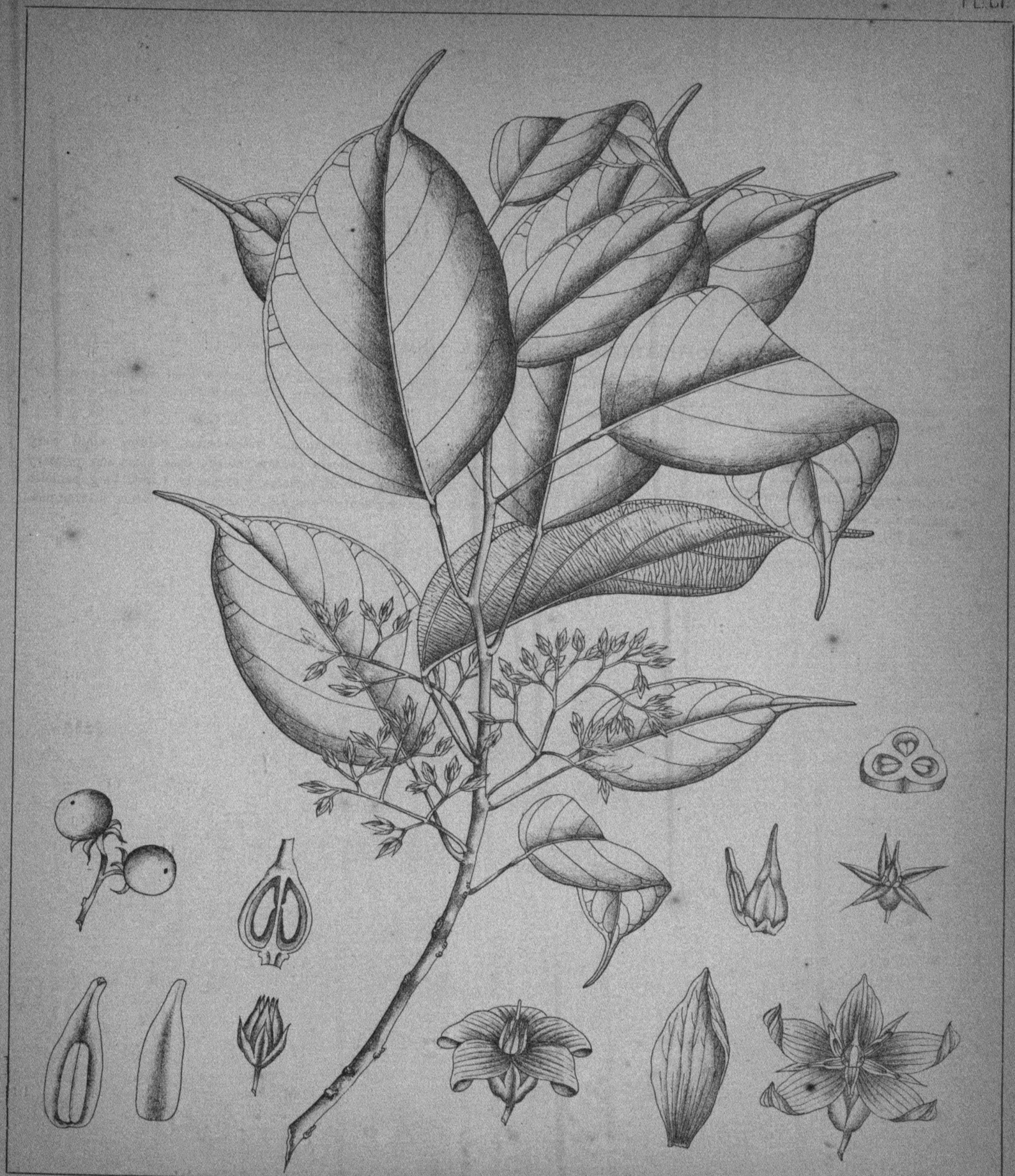
Semecarpus acuminatus? Hk.

MONOPORANDRA CORDIFOLIA. (Nat. order Dipterocarpeæ.)

MONOPORANDRA. *Thw.*—GEN. CHAR. Calyx 5 parted divisions equal not enlarging in fruit, petals 5 equal æstivation convolute, stameus 5 monadelphous in one series in a short ring round the base of the ovary, the rest as in Stemonoporus. *Thw. Hook. Jour. of Bot. vol.* vi. *p.* 5;—*Benth. and Hook. Gen. Pl. p.* 194;—*DC. Prod.* xvi. *p.* 637.

MONOPORANDRA CORDIFOLIA. (Thw.) A middling sized, much branched tree, leaves shining rigid very coriaceous ovate or oblong with a very sudden long blunt acumination, rounded but scarcely cordate at the base, costa and primary veins very prominent beneath depressed above, $2\frac{1}{2}$-$4\frac{1}{2}$ inches long by $1\frac{1}{4}$-$2\frac{1}{4}$ inches broad, petioles $\frac{1}{2}$ to nearly 1 inch long, panicles much shorter than the leaves, slightly puberulous, flowers very small, calyx segments very acute, fruit small size of a large pea. *Thw. En. Pl. Zey. p.* 39.

Ceylon, in the Ambagamwa and Saffragram districts, at an elevation of about 3,000 *feet.*



Govindoo, del.

Monoporandra cordifolia (Thw.)

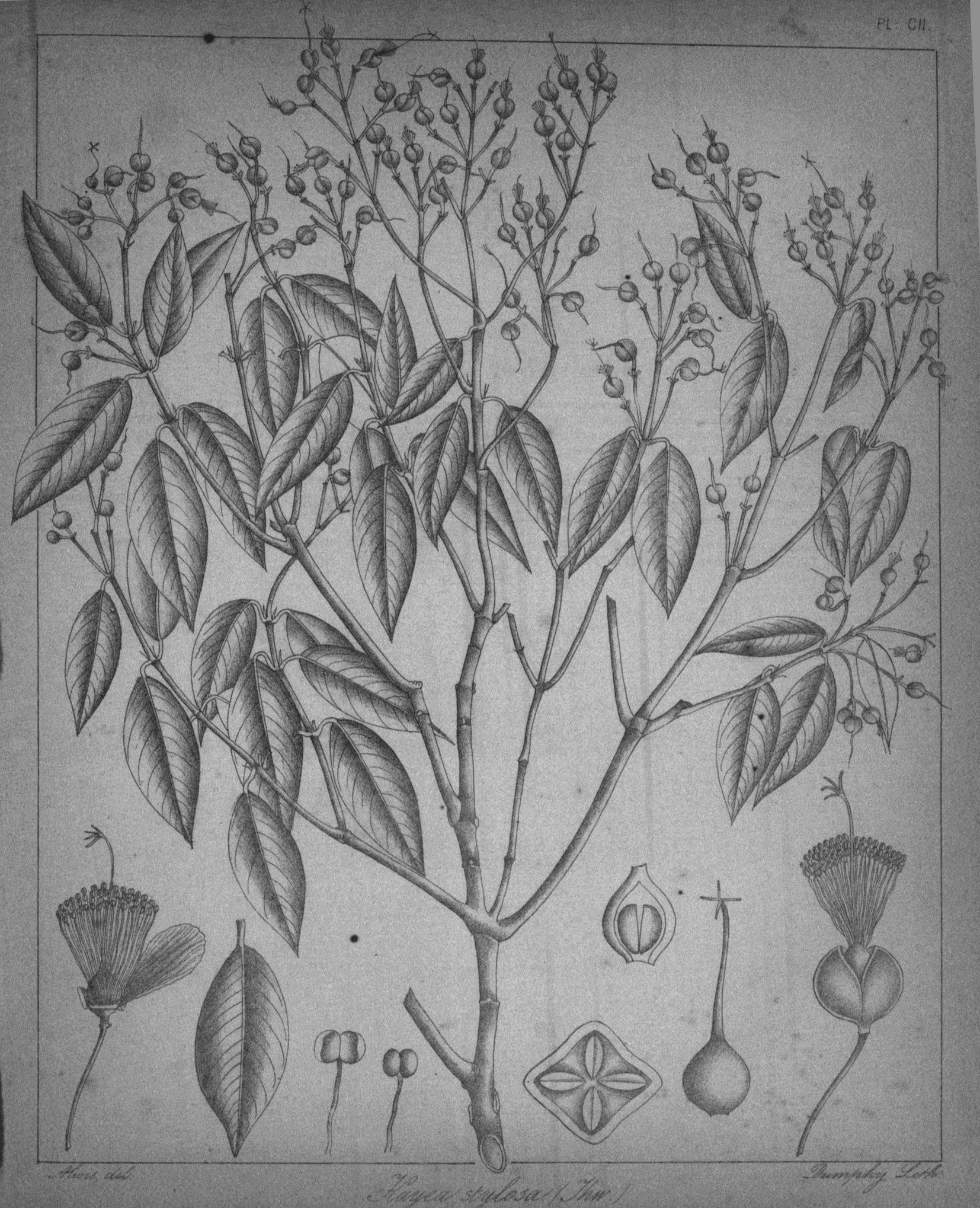
Dumphy Lith.

KAYEA STYLOSA. (Nat. order Guttiferæ.)

KAYEA. *Wall.*—GEN. CHAR. Flowers hermathrodite (or polygamous ?), sepals 4 petals 4, stamens numerous free or scarcely united at the base, filaments long filiform, anthers small subglobose 2 celled dehiscing longitudinally, ovary 1 celled, style elongate shortly and acutely 4 cleft at the apex, ovules 4 erect, capsule roundish coriaceous indehiscent included in the much enlarged coriaceous calyx 1-4 seeded, testa membranaceous colored, cotyledons fleshly. Trees, leaves oblong penninerved, flowers numerous small in terminal panicles or solitary and large.

KAYEA STYLOSA. (Thw.) A large tree, branches terete glabrous reddish, leaves ovato-lanceolate acuminate, 2-3 inches long by 7-10 lines broad, petiole 2-3 lines long, flowers very fragrant small in terminal panicles or from the upper axils, style much longer than the numerous stamens. *Thw. En. Pl. Zey. p.* 50.

This elegant tree has only been found in Ceylon, in the south of the island at no great elevation; it is called Soovanda by the Singhalese. The timber is valued for building purposes.



Moore del. Dumphey Lith.

Hayea stylosa (Thw.)

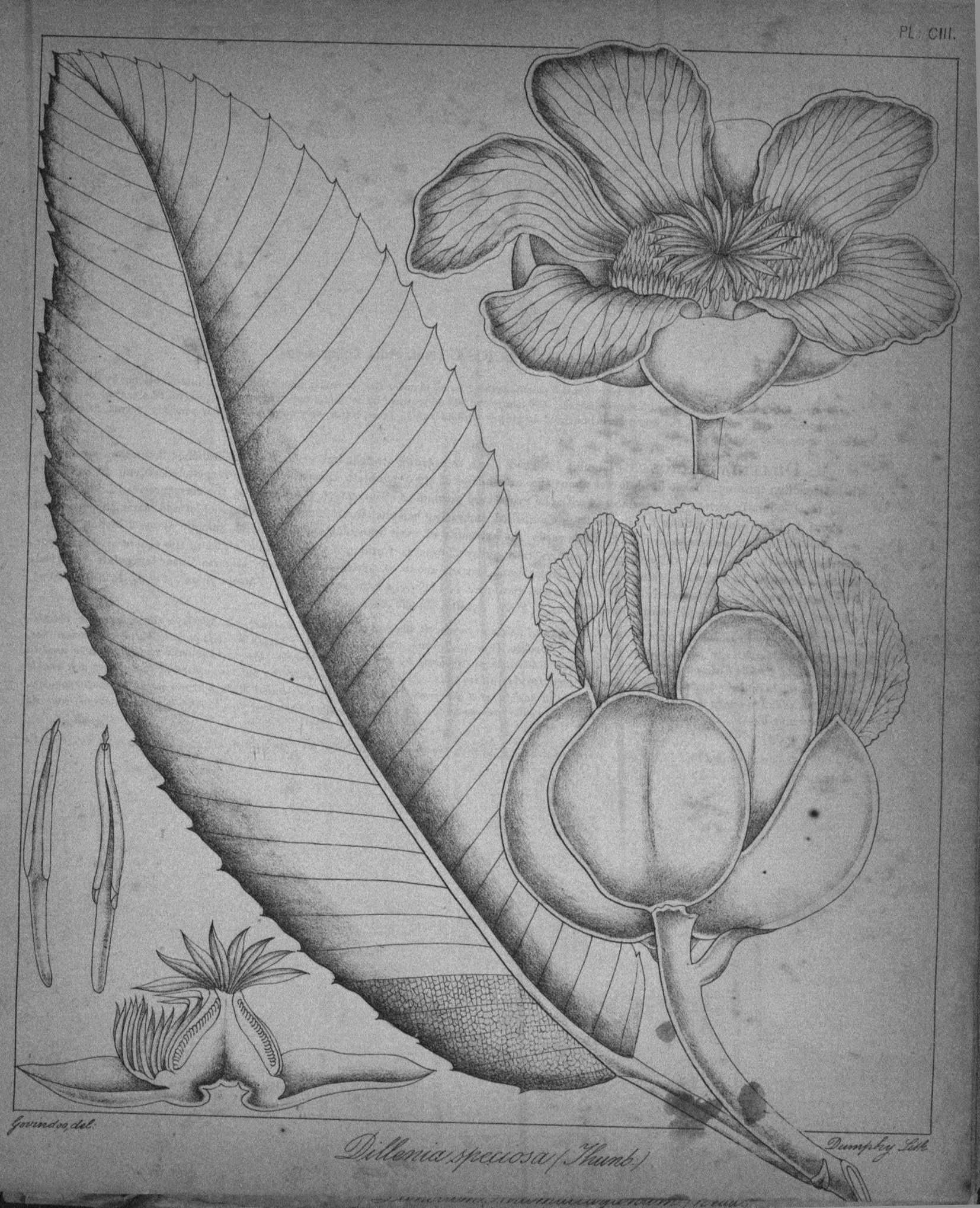
DILLENIA SPECIOSA. (Nat. order Dilleniaceæ.)

DILLENIA. *Linn.*—GEN. CHAR. Sepal 5 patent, petals 5 large, stamens free or nearly so, anthers adnate linear dehiscing by two fissures, interior erect introrse, exterior recurved extrorse, carpels 5-20 many ovuled and crowned by as many radiating styles united round a central conical axis into a spurious berry enclosed in the calyx, seeds immersed in pulp or without pulp. Trees, leaves very large prominently parallely nerved, flowers large solitary or fascicled white or yellow.

DILLENIA SPECIOSA. (Thunb.) A good sized tree, trunk straight but of no height, branches numerous spreading, then ascending, forming a dense head, leaves about the extremities of the branchlets approximated short petioled oblong or lanceolate acute, most regularly serrate, very coriaceous with the veins very prominent excurrent at the points of the serratures, 9-12 inches long by about 4 inches broad, petioles 1-2 inches long, channelled, embracing half the circumference of the branchlet and leaving a permanent scar after falling off, peduncles generally one towards the extremity of each branchlet clavate round smooth about 3 inches long, 1 flowered, flowers very large white fragrant, anthers opening by 2 fissures forming a large yellow globe in the centre of the flower, which is crowned by the white lanceolate spreading stigma, carpels about 20, styles scarcely any, stigmas linear-lanceolate recurved, fruit 3-4 inches in diameter, seeds in pulp, numerous reniform or obliquely oval very hairy. *Thunb. Linn. Trans.* 1. 200 ;—*Roxb. Fl. Ind.* iii. 650. Dillenia elliptica, *Thunb. Trans.* 1. 200. Syalita, *Rheed. Mal.* iii. *t.* 38, 39.

One of the handsomest trees in India, it is found in dense forests at no great elevation in Malabar, the Northern Circars, Orissa, the Godavery forests, in various parts of Northern India; Bombay, Ceylon, Birmah, and in the Malay Peninsula ; it is called Chaltà in Hindustanee, and Uva and Pedda Kalingà in Telugu ; it is much cultivated, particularly by natives about temples ; the wood is hard and tough, and used to make gun stocks and for boats, and is said to be very durable under water. The ripe fruit is eaten by natives in curries, and makes a tolerable jelly, and added to syrup is used as a cough mixture; it has rather a disagreeable odour. The tree is called Mota Kurmal in the Mahratta country, Hondapara in Ceylon, and Kaloonoot in Birmah; the timber weighs 44 lbs. the cubic foot when seasoned, and 55—60 when unseasoned, and its specific gravity is ·704.

The unexpanded bud in the plate is from a drawing made in the Ceylon Herbarium, and the full flower and analysis from Dr. Wight's plate.



Govindoo del.

Dillenia speciosa (Thunb.)

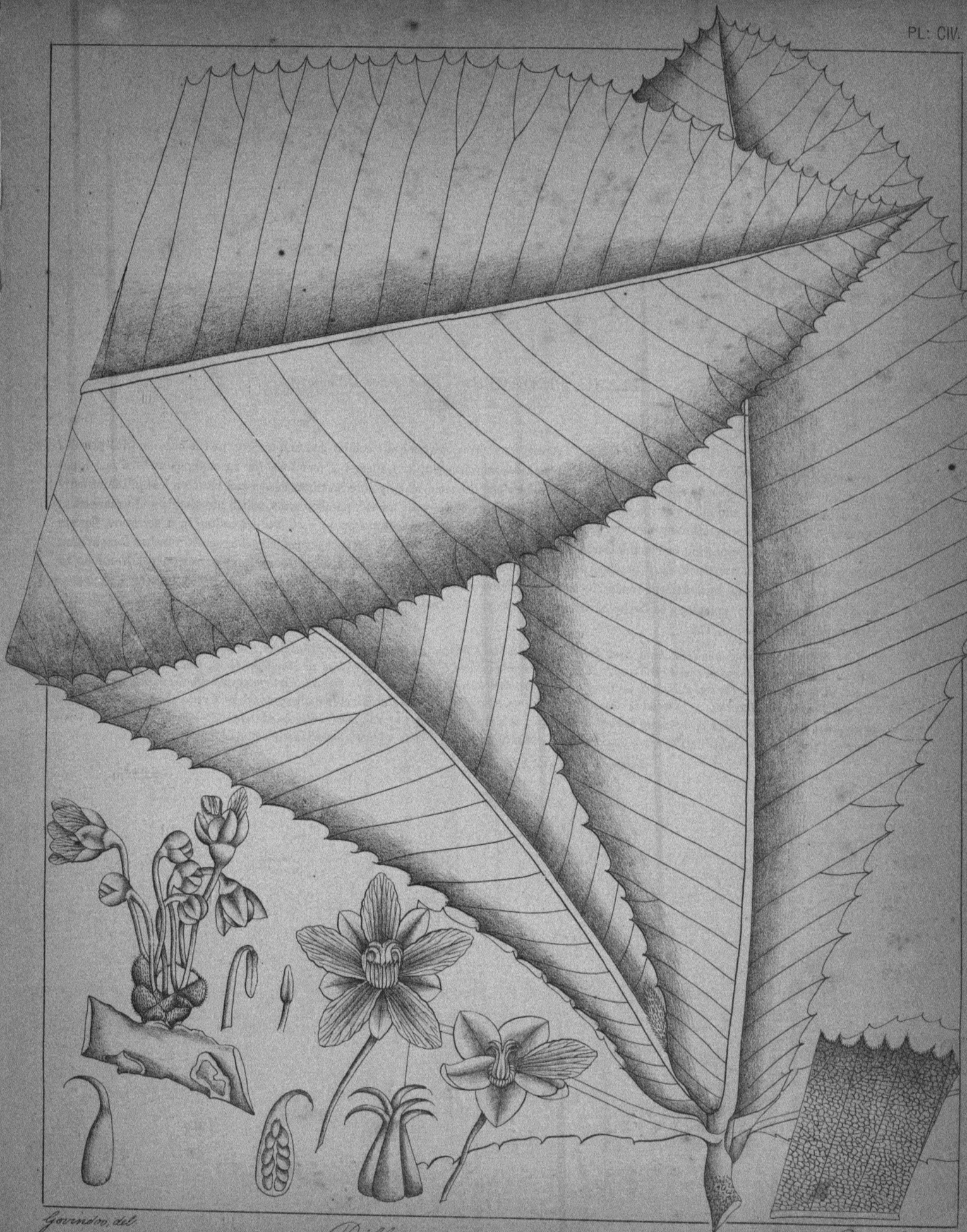
Dumphy Lith.

DILLENIA PENTAGYNA. (Nat. order Dilleniaceæ.)

For Gen. Char. see letter press to Pl. ciii.

DILLENIA PENTAGYNA. (Roxb.) A very large tree, leaves quite sessile and amplexicaul at the base or with petioles 1-4 inches long, oblong to oblongo-lanceolate or obovate acute or obtuse at the apex, 1-2 feet long (or in saplings up to 5 feet long) paler beneath, when adult very coriaceous glabrous or puberulous beneath, when young membranaceous and more or less pilose or sericeous according to age and ciliate at the margin, very prominently veined with raised parallel veins which are simple and excurrent at the margin into a sharp serrature or once or twice forked (generally only towards the apex) each veinlet ending in a serrature, flowers ½-¾ inch in expansion appearing before the leaves in small clusters along the older branches, pedicels 5-8, one-two inches long arising from several small concave thick silky bractes, sepals unequal the 3 outer ovate the 2 inner longer and narrower, petals oblong to obovate yellow very caducous, stamens numerous the interior row longer than the other and reflexed like the styles, ovaries 5, styles reflexed, stigmas simple apiculate, seeds by abortion 1-2. *Roxb. Fl. Ind.* ii. 652. Dillenia angusta et pilosa, *Roxb. l. c.* Colbertia Coromandelina, *DC. Prod.* 175.

This tree is most abundant throughout South India and in Northern India and Birmah, but does not occur in Ceylon ; it is to be met with in almost every forest in this Presidency. It flowers towards the end of January, or as late as March or April, when the tree is destitute of leaves. It is called Rāi, Pine and Nài-tek in Tamil in different districts, Chinna Kalingá in Telugu, Kanagalee and Machil in Canarese, and in Birmah Yeengà and Bjooben. The wood is close grained, strong, tough, fibrous and durable even under ground, of a reddish brown colour and a pretty wavy surface on one side, not easily worked and subject to warp and crack ; a cubic foot unseasoned weighs 85—90 *lbs., and* 70 *lbs, when seasoned ; its specific gravity is* 1·120 *; it is used in house and ship building, and is adapted for cabinet purposes.*



Govindoo, del.

Dillenia pentagyna. (Roxb.)

Piumphy, Lith.

STERCULIA. Linn. (Nat. order Sterculiaceæ.)

GEN. CHAR.: Flowers unisexual or polygamous. Calyx more or less deeply 5 cleft, rarely 4 cleft, usually colored. Petals none. Staminal column adnate to the gynophore, bearing at the summit 15 or rarely 10 stamens, irregularly clustered in a head. Carpels of the ovary 5, distinct or nearly so, with two or more ovules in each. Styles united under the peltate or lobate stigma. Fruit carpels distinct, spreading, either firm or woody, and scarcely opening along the inner edge, or thinner, and opening as follicles, even long before they are ripe. Seeds 1 or more in each carpel, rarely winged; albumen adhering to the cotyledons, often splitting in two, assuming the aspect of fleshy cotyledons; real cotyledons flat or nearly so, and thin, the radicle next the hilum or at the opposite end, or intermediate. Trees, leaves undivided or lobed, or digitately compound. Flowers in panicles or rarely racemes, mostly axillary, sometimes very short; terminal flowers usually female, in these the staminal column is shorter and the anthers less perfect than in the males, surrounding the base of the ovary; in the males the ovary is often entirely abortive.—Brachychiton, Trichosiphon, *and* Pœcilodermis, *Schott*; Delabechea, *Lindl.*; Cavallium, *Schott.*; Southwellia, *Salisb.*; Firmiana, *Mars.*; Pterygota, *Schott.*; Hildegardia, *Schott.*; Carpophyllum, *Mig.*; Scaphiam, *Schott.*; Pterocymbium, *Br.*; Triphaca, *Lour.*

Sterculia guttata. A large tree, with a tolerably straight trunk, bark cracked, leaves oblong to very broad ovate slightly cordate at the base entire with a longish sudden acumination, upper side smooth and shining, beneath very softly villous, about 7-9 inches long by 4-5 broad, petioles round downy 2-5 inches long, stipules ensiform early caducous, racemes terminal and from the divisions of the branchlets simple densely villous, flowers in threes, very shortly pedicelled about ¾ inch across, chiefly hermathrodite, bractes lanceolate, a larger one below the middle flower and a very minute one below each of the others, calyx densely villous on the outside, hairy within and beautifully freckled with purple, ovary long pedicelled globose 3-5 lobed downy 3-5 celled, fruit carpels generally 5 coming to maturity semi-ovate, about 3 inches long by 2 broad, villous of a brilliant red color; seeds oblong jet black. *Roxb. Fl. Ind.* iii. 149.

A very common tree in almost every forest in Southern India and in Ceylon; it is a beautiful object when covered with its bright red capsules; the timber is not used that I am aware of, but the bark yields a valuable cordage, and is also made into a kind of clothing in some parts of the western coast: for this purpose it is taken off in strips, beaten, washed, and dried in the sun; the tree is called Kāwillee by the Kaders on the Anamallays, and Kukar and Goldar on the Bombay ghats.

Govindoo, del. Dumphy, Lith.

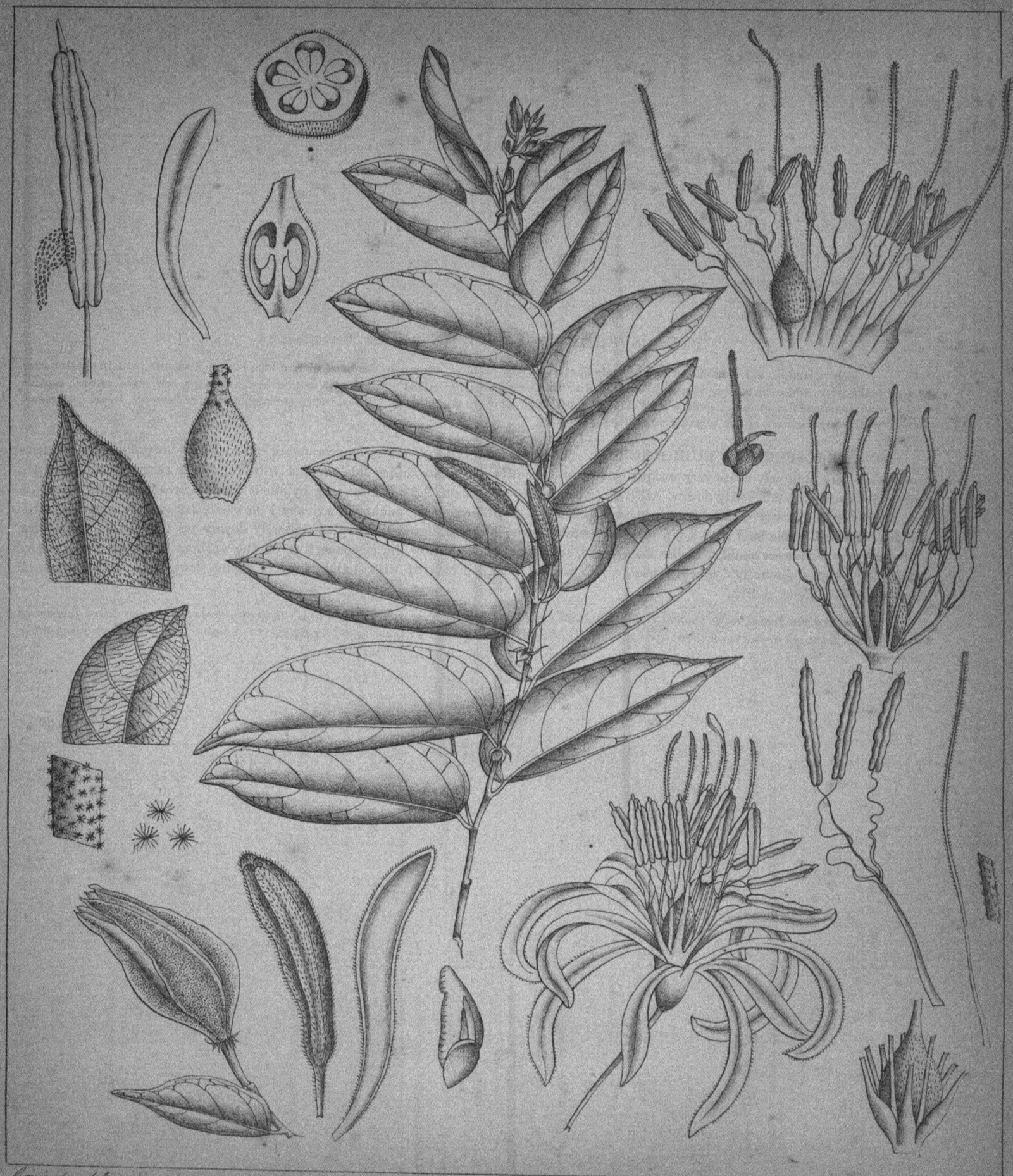
Sterculia guttata, (Roxb.)

PTEROSPERMUM. Schreb. (Nat. order Sterculiaceæ.)

GEN. CHAR. : Calyx tubular 5 lobed, petals 5, stamens united into a column at the base with 5 long barren filaments, and 15 shorter ones (in 5 phalanges of 3 each) each bearing a linear erect 2-celled anther, ovary shortly stalked 5 celled with several ovules in each cell, style entire, capsule woody with a loculicidal dehiscence, seeds winged at the upper end, albumen scarcely any. Trees, with a stellate or scaly pubescence, leaves coriaceous, flowers usually large solitary or few together on axillary peduncles.

PTEROSPERMUM RUBIGINOSUM. (Heyne). A very large tree, young branches covered with brownish rusty tomentum, leaves very obliquely ovate very unequal sided, quite entire acuminate, upper side covered with fugacious rusty down at length quite glabrous, under side softly downy, with close set brown tomentum, 2-2½ inches long by about 1 inch broad, petioles about 2 lines long, stipules downy with a broad concave base and 1-2 filiform teeth, peduncles axillary 1 flowered 2-3 times longer than the petioles furnished at the base with a few bractes resembling the stipules, flower bud angled stellately downy on the outside, bracteoles of the calyx none, flowers about 2 inches long, white, sepals and petals narrow linear, connective of the anthers produced into a terminal point, stigma obscurely 5 lobed, capsule ovate pointed 5 angled covered with stellate down, 2 inches long by about ¾ inch in diameter.—*WA. Prod. p.* 68.

This very fine tree is very common in the Tinnevelly districts, the Wynad, Anamallays, and generally throughout our western forests up to about 3,000 *feet; the timber is excellent, and the tree is called Kara toveray in Tinnevelly, where the wood is much in use for building and other purposes.*



Gordon del.

Pterospermum rubiginosum (Heyne)

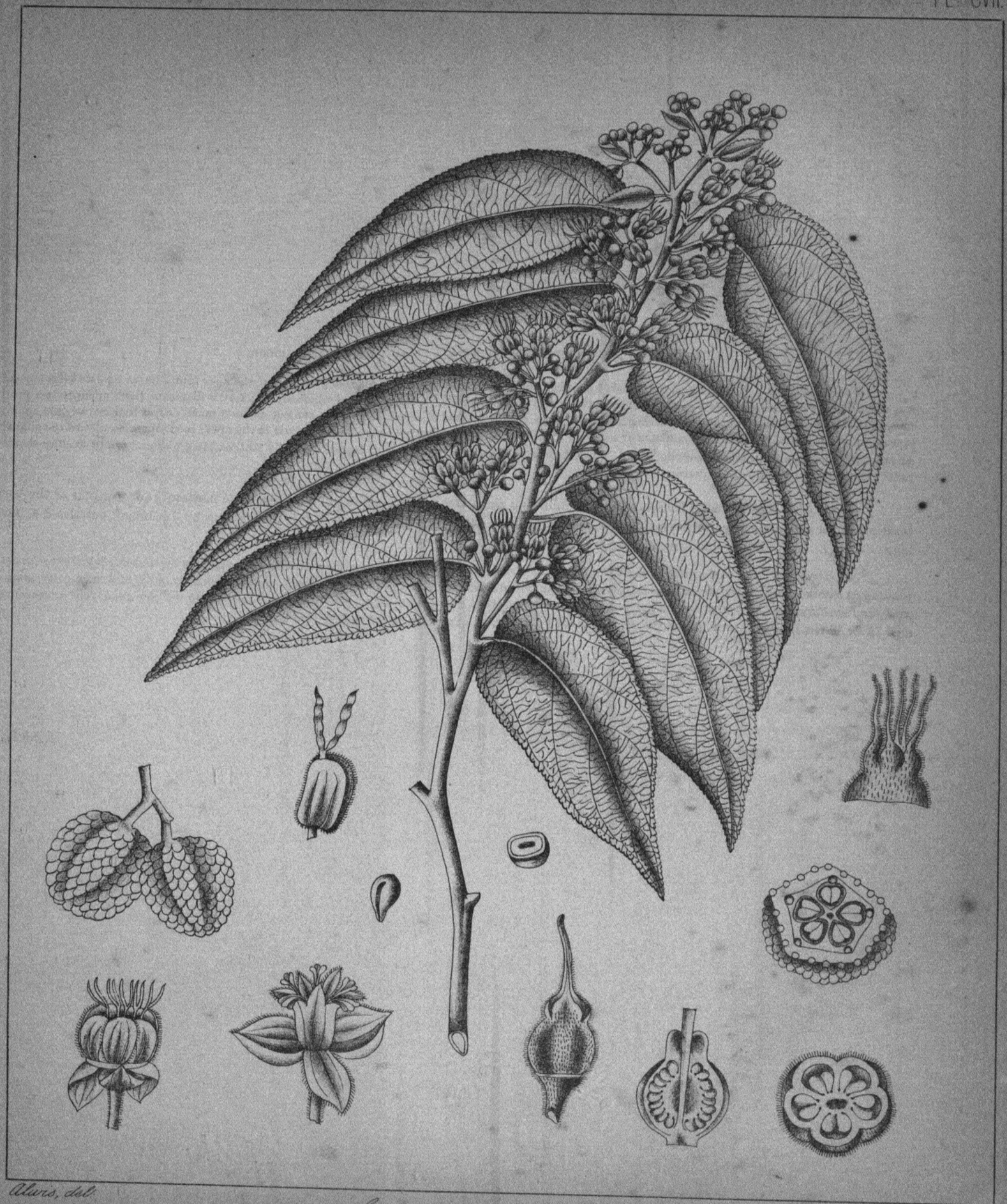
Dumbey, Lith.

GUAZUMA TOMENTOSA. (Nat. order Sterculiaceæ.)

GEN. CHAR.: Calyx 2-3 parted, petals 5 subunguiculate at the base cucullato-concave produced at the apex into a linear ligulate bifid appendage, staminal tube or urceolus with 5 sterile acute lobes alternate with the petals, in the sinuses of which are the fertile filaments (each opposite to a petal) connate at the base and trifid above each bearing 3 anthers, ovary sessile 5 lobed 5 celled, cells many ovuled, styles 5 more or less connate, stigmas simple, capsule subglobose woody tuberculoso-muricate or echinate with long hairs, imperfectly loculicidally 5 valved at the apex, seed albuminous, embryo slightly curved, cotyledons plaited, radicle near the hilum. Trees stellately pubescent or glabrescent, leaves unequally toothed often oblique, cymes axillary shortly pedunculate, flowers small. Diuroglossum, *Turcz.*

GUAZUMA TOMENTOSA. (DC.) A middling sized tree, leaves ovate oblong acuminate cordate and unequal at the base toothed, upper side stellately pubescent, under with a stellate white tomentum, about 3-4 inches long by 1¼ broad, petioles 3-4 lines long. *DC.* 1. 485. Boubroma tomentosa, *Spr.* Guazuma ulmifolia, *Wall.*

This tree has been naturalized in India, being of American origin; it is now very common throughout the Presidency, being largely planted in avenues and topes, &c. The wood, which is known as Bastard Cedar, is light and loose grained, and of a light brown color, and is used for furniture, and by coach makers for pannels, and for packing cases, pannelling, &c. It weighs about 40-45 lbs. per cubic foot unseasoned, and 32 lbs. when seasoned, and its specific gravity is ·512; the leaves are an excellent fodder for cattle.



Alvis, del.

Guazuma tomentosa. (D.C.)

Dumphy, Lith.

GREWIA. LINN. (Nat. order Tiliaceæ.)

GEN. CHAR. : Flowers regular hermathrodite pentamerous, sepals distinct, petals unguiculate, claw thickened glandular ciliate, rarely wanting, stamens indefinite all fertile free springing from a raised glandular torus, ovary 2-4 celled, cells 2-many ovuled, style subulate, stigma shortly 2-4 lobed, drupe 1-4 stoned entire or lobed, stones 1-2 or more seeded and divided by spurious dissepiments between the seeds, seeds ascending or horizontal, albumen fleshy or horny, cotyledons flat leafy. Trees or shrubs, frequently covered with stelliform hairs, leaves entire or lobed 3-7 nerved, flowers yellow or pink in axillary or terminal cymes. Mallococca et Chadara, *Forsk.* Microcos, *Linn.* Omphacarpus, *Korth.*

GREWIA TILIÆFOLIA. (Vahl) A large tree, the younger parts covered with a short dense coating of felted hairs, at length sub-glabrous, leaves obliquely cordate roundish, acuminate or rounded at the apex irregularly toothed sometimes with a tendency to be lobate at the apex, 4-6 inches long by 2-4 broad, 5 nerved at the base, petioles about 1 inch long, stipules transverse falcate lanceolate caducous, peduncles axillary or emerging a little on one side of the petiole, 2-3 together equal to or a little exceeding the petioles, 3-5 flowered, pedicels furnished with bracts, sepals linear oblong, petals oblong ½ the length of the sepals, torus scarcely exceeding the glands, style about twice as long as the stamens, stigma 4 lobed, drupes globose or 2-rarely 4 lobed, lobes globose with two hemispherical 3 celled nuts or one spherical 6 celled nut in each lobe. *Vahl. Symb.* 1. *p.* 35 ;—*Roxb. Fl. Ind.* ii. *p.* 587. G. arborea, *Roxb.* G. elastica, *Royle ?*

A very common tree throughout the Madras Presidency and all over India and Ceylon ; it ascends the mountains to about 4.000 *feet, and is often found of large size in favorable localities; the berries are eaten, having an agreeable acid flavour ; the timber is highly prized for strength and elasticity, and is used for building purposes, bows, buggy shafts, walking sticks, and a variety of other uses; it is much in use at Jubbulpore, where the tree is known by the name of Dhâman, it is light and rather soft, flexible and fibrous, coarse grained and durable, of a light pinkish color turning to light brown, and easily worked ; unseasoned it weighs* 45 *to* 50 *lbs the cubic foot, and* 34 *lbs when seasoned, its specific gravity is* ·544. *The tree is called Tharrâ or Thadâ in Tamil, Charâchi in Teligu, Thadsal or Butale in Canarese; the leaves make a good fodder, and the bark (like that of all the Grewias) is used as cordage.*

Gourndco del. *Grewia tiliæfolia (Vahl.)* Dumphy Lith.

GERANIALES.

ORDER XVIII.—LINEÆ.

Flowers regular, hermathrodite. Sepals 5, rarely 4, free or united at the base, imbricate or rarely almost valvate. Petals as many, hypogynous or rarely slightly perigynous, imbricate usually contorted. Stamens as many as petals or twice or rarely thrice as many united into a ring or short tube at the base ; anthers 2-celled, with parallel cells opening longitudinally. Glands 5, adnate to or embedded in the outside of the staminal tube or rarely wanting. Disk none (besides the staminal tube). Ovary free, entire, 3 to 5 celled. Ovules 2 or rarely 1 in each cell, pendulous anatropous, with a ventral raphe. Styles 3 to 5, distinct or more or less united, with terminal usually capitate stigmas. Fruit either a capsule, separating into cocci, usually dehiscent, or a drupe, with as many pyrenes as carpels, or more frequently reduced by abortion to 1. Seeds 1 or 2 in each coccus or pyrene ; testa membranous or almost coriaceous ; albumen fleshy, abundant or thin or entirely wanting. Embryo usually straight, with flat, ovate cotyledons ; radicle superior. Herbs, shrubs, or rarely trees, glabrous or rarely hirsute or tomentose. Leaves alternate or very rarely opposite, simple and entire or slightly serrate. Stipules lateral or within the petiole, sometimes minute or wanting.

Of no importance as a forest order ; the only tree being the Erythroxylon.

The Hugonia mystax, a scandent shrub, and the Linums (or flaxes) are the only other S. India plants belonging to this order.

ERYTHROXYLON.

For Gen. Char. see letter press to Pl. lxxxi.

1. Erythroxylon Indicum, *DC.*—For description see Pl. lxxxi.

ORDER XIX.—GERANIACEÆ.

Flowers usually hermathrodite, regular or irregular. Sepals 5, or rarely fewer, free, or rarely connate at the base, imbricate or valvate in the bud. Petals as many or rarely wanting, hypogynous or slightly perigynous, variously imbricate in the bud. Torus more or less expanded into a disk, often bearing 5 glands alternate with the petals ; and usually protruding into a short axis in the centre of the ovary. Stamens usually twice the number of the petals, 5 of them occasionally without anthers, or rudimentary ; or in irregular flowers, 3 or more without anthers or wanting ; filaments either free and filiform, or dilated or connate at the base ; anthers with 2 parallel cells. Ovary usually 3 to 5 lobed, with as many cells, the carpels adnate to the axis up to the insertion of the ovules, and often produced above that into a beak bearing the style or stigmas ; stigmas as many as cells, either raised on the style or sessile on the carpels, radiating from a connate base or rarely entirely connate. Ovules either 1 in each cell or 2 inserted nearly at the same point, 1 ascending the other pendulous or several in 1 or 2 rows. Fruit either a lobed capsule, lobes 1 seeded, separating from the axis with the seed, and elastically rolled upwards along the beak, leaving the placentiferous portion attached to the axis, or the lobes several seeded, remaining attached to the axis, but opening loculicidally, or, the fruit is a berry or separates into indehiscent cocci. Seeds pendulous or ascending ; testa thin or rarely crustaceous ; albumen usually scanty or none. Embryo straight or curved, radicle short and straight or long and curved or forked over the cotyledons. (Herbs or shrubs, or rarely) trees, leaves opposite or alternate, toothed, lobed, or divided, very rarely quite entire. Stipules usually 2. Peduncles axillary, 1 or 2 flowered, or bearing an umbel of several flowers, very rarely a cyme or raceme.

An order of no importance to the forester ; two species of Averrhoa being the only trees. Of herbaceous plants it contains all the balsams, the Oxalis and Geranium there are no shrubs.

Tribe Oxalideæ. Flowers regular, sepals imbricate, glands none, stigmas capitate, ovules 2-many, leaves compound.
Stamens 10, sometimes 5 sterile, styles distinct, ovules many in the cells, fruit indehiscent, trees with pinnate leaves ... ...Averrhoa.

AVERRHOA. Linn.

For Gen. Char. see letter press to Pl. cxvii.

1. Averrhoa Bilimbi, *Linn.*—For description, &c. see Pl. cxvii.

2. Averrhoa Carambola, *Linn.*—A small tree, leaves alternate glabrous or more or less pubescent, leaflets 5 to 11 very obliquely ovate acuminate 1½-2 inches long of a pale or glaucous color on the under side, where they are usually more pubescent, flowers small reddish in axillary sessile panicles of 1-2 inches long or forming rather large panicles at the ends of short branches, sepals about 1 line long glabrous, petals nearly twice as long roundish, the 5 smaller stamens usually very minute and wholly without anthers or occasionally 1 or 2 of them are longer with small barren anthers, fruit oblong acutely angled, seed arillate. *Linn.* ;—*DC.* 1. 689. Tarmara tonga, *Rheede. Mal.* iii. *t.* 43, 44.

Common in a cultivated state all over India, but I have not met with it wild, it is commonly known as the Carambola and is called Kamaranga in Hindoostani, the fruit is eaten and preserved and pickled, the juice is useful in removing iron moulds from linen, the leaves are a good fodder, and with the root and fruit are used medicinally by the natives and the latter is used for dyeing.

1-1½ broad, panicles terminal and from the exterior axils often dichotomous, bractes minute caducous, flowers very small yellow, filaments shorter than the petals, united, styles thick length of the filaments, fruit round size of a pea much pitted, 1 seeded, seed round shining black. *Roxb. Fl. Ind.* i. 417.

Anamallay forests, and elsewhere in the western forests, mountains of the Northern Circars and Ceylon ; called Rhetsà màn in Teligu and Sessal on the Bombay ghats ; the seeds taste exactly like black pepper ; in Ceylon the tree is called Kattu Kina.

2. ZANTHOXYLUM ALATUM, *Roxb.*—A small tree or large shrub, thorns stipularly very sharp straight or recurved from a strong broad base, leaves alternate unequally pinnate up to 12 inches long, rachis broadly winged between the leaflets, leaflets about 4-6 pair with an odd one subsessile linear lanceolate gradually acute at the apex and attenuated and unequal sided at the base, serrate crenulate or sub-entire 3½ inches long by one broad, in age smooth on both sides and furnished with pellucid dots, racemes axillary often compound shorter than the leaves, flowers minute pale yellow, calyx 6-8-cleft, divisions acute, petals 0 : in the male, stamens 6-8 much longer than the calyx, rudimentary ovary of 2-3 style like abortive carpels, in the female stamens 0, ovary 3-4 rarely 5 carpels, 1 celled, cells 2 ovuled, ovules attached to the top of the axis, fruit carpels 1-3 come to maturity roundish reniform or ovate size of a pea much pitted or wrinkled, seed 1 shining black. *Roxb. Fl. Ind.* iii. 768.

A small tree or large shrub not uncommon on the mountains in the Vizagapatam and Ganjam districts, but I have not seen it to the south except in cultivation in gardens ; it is common in Bengal ; the seeds are used medicinally.

3. ZANTHOXYLUM SEPIARIUM, *Wight* ; and 4. ZANTHOXYLUM OVALIFOLIUM, *Wight* (*Ill. p.* 169), are small rigid shrubs not uncommon throughout our western ghats, and scarcely differ except that the former is thorny and the latter unarmed.

5. ZANTHOXYLUM TETRASPERMUM, *WA.* ; *Thw. En. Pl. Zey. p.* 69, is a very large thorny creeper common in nearly all the moist forests of the western ghats up to 5,000 feet, and in Ceylon—(leaflets 2-4 pair with an odd one, inflorescence glandularly pubescent).

Analysis, Pl. VI, fig. 3.

ZANTHOXYLUM OVALIFOLIUM.

1. A male flower showing the imbricate petals.
2. The same, petals removed, showing the 4 stamens and the abortive ovary.
3. A petal.
4. Stamens, back and front view.
5. Abortive ovary showing glandular disk at its base.
6. Zanthoxylum Rhetsa, 1 pair of leaflets from the centre of the pinnate leaf.
7. A fruit showing that it consists of a single coriaceous 1-seeded coccus.

ACRONYCHIA. FORST.

Gen. Char. Flowers polygamous. Calyx 4 lobed. Petals 4, valvate. Torus thick. Stamens 8 ; filaments subulate. Ovary 4-celled ; style terminal, stigma entire or obscurely 4 lobed, ovules 2 in each cell, superposed. Fruit 4 celled, usually succulent with a coriaceous or hard endocarp opening loculicidally or drupaceous and indehiscent. Seeds usually solitary in each cell with a crustaceous black testa ; albumen fleshy ; embryo straight, cotyledons oblong. Trees or shrubs. Leaves opposite or alternate, 1 foliolate. Flowers white or yellowish, in axillary or rarely terminal small panicles or loose cymes.—Cyminosma, *Gærtn.*

ACRONYCHIA PEDUNCULATA, *DC.*—A small or middling sized tree, leaves opposite elliptic lanceolate entire glabrous furnished with minute pellucid dots, 4-5 inches long by 1½-2 broad, petioles 1-1½ inches long, peduncles axillary about the summit of the branches, and terminal, corymbiform, flowers yellowish green.—Cyminosma pedunculata, *DC.* 1. 722. C. Ankœnda, *Gærtn. fr.* 1. 280. Jambolifera, *Vahl. Symb.* 3. *p.* 52. Gela lanceolata, *Lour.* Selas lanceolatum, *Spr. Syst.* 2. *p.* 216. Ximenia ? lanceolata, *DC.* 1. 583 ;—*Rheede Mal.* 5. *t.* 4. 15. Acronychia, *Walps. Rep.* 1. 523.

This tree is most abundant in all our mountain forests on the western side of the Presidency, up to about 5,000 feet elevation, and is also found in Ceylon ; it appears to be in flower and fruit at all seasons, and is worthy of cultivation in gardens.

Analysis, Pl. VI, fig. 4.

ACRONYCHIA PEDUNCULATA.

1. A full flower showing the 10 stamens alternately shorter, and the 4 revolute petals valvate (in bud).
2. A petal removed.
3. Stamens.
4. Ovary cut vertically, showing the 2 superposed ovules in each cell.
5. Ovary cut transversely, showing the 4 cells.
6. A seed cut to show the embryo lying in albumen.
7. Embryo and cotyledons.
8. A young fruit which is a drupe with a fleshy sarcocarp and a hard coriaceous nut inside.

TODDALIA. JUSS.

Gen. Char. Same as Zanthoxylon, but ovary not lobed and fruit indehiscent ; petals 2-5.

1. TODDALIA ACULEATA, *Pers.*—A thorny shrub sometimes scandent very variable in its foliage, common throughout the Presidency.

2. TODDALIA BILOCULARIS, *WA.*—A very handsome dark green-foliaged small or middling sized unarmed tree, flowers 2 or occasionally 3-merous. *WA. Prod. p.* 149. Dipetalum, *Dalzell.*

Anamallays, 2-4,000 feet in moist forests. Bombay ghats.

Analysis, Pl. VI., fig. 4.

TODDALIA ACULEATA.

1. A male flower, showing the imbricate petals.
2. The same open, showing the 5 equal stamens and abortive ovary.
3. A female flower.
4. Ovary cut transversely, showing the 5 cells.
5. The same cut vertically, showing the 2 superposed ovules in each cell.
6. A young fruit, which is fleshy pitted on the rind, and indehiscent.

1 to 5 are from the small leaved variety, and No. 6 is a life-size fruit of the larger leaved variety [T. floribunda, *Wall.* ; Limonia oligandra, *Dalz.*]

GLYCOSMIS. CORR.

Gen. Char. Calyx 5-cleft, the lobes broadly imbricate. Petals 5, imbricate in the bud. Stamens 10, filaments dilated at the base, anthers often tipped with a small gland. Ovary 3-to 5 or rarely 2-celled ; style very short, thick and persistent, the stigmas scarcely broader, ovules solitary in each cell. Berry succulent or almost dry usually 1-seeded. Seeds with a membranous testa, without albumen ; cotyledons fleshy. Unarmed trees or shrubs, leaves alternate, pinnate, with few alternate leaflets, or 1-foliolate. Flowers small, in axillary or terminal panicles.

GLYCOSMIS PENTAPHYLLA, *Corr.*—A small tree or more commonly a large shrub, leaflets 3-7 rarely 1-foliate, variable in shape but usually more or less lanceolate entire or obsoletely crenulate, 1-9 inches long (usually about 4-5), panicles axillary or terminal from a few lines long to 3 4 inches, 3-many flowered, flowers variable as to size, petals 4-5, filaments filiform or flat on their whole length or flat to nearly the apex and there filiform below the anther, ovary 4-5 celled more or less raised on a gynophore and with the fruit glabrous. *Correa de Serra Ann. de Mus. tom.* vi. 384. Glycosmis pentaphylla, arborea, nitida, triphylla, angustifolia, and chylocarpa, *of WA. Prod. p.* 92 *and* 93. Limonia, *Roxb. Fl. Ind.* ii. 381.

A most variable plant, generally only a shrub, but sometimes a small tree, common throughout every part of India, Birmah, and Ceylon, and extending to the Straits, China, Australia and the Philippines; it ascends the mountains to 5,000 feet, but is most abundant in the jungles in the plains. Professor Oliver has united all the 6 species described in *Wight and Arnott's Prodromus*, and *Wight's Ill.*, but he makes several varieties; these however run one into another. A form, which I take to be Thwaites's G. bilocularis, with the inflorescence extremely reduced and very small leaves, is common in Tinnevelly. The genus differs from all the other Aurantiaceæ in its style being very short and persistent and not articulated with the ovary.

Analysis, Pl. VI, fig. 6.

GLYCOSMIS PENTAPHYLLA.

1. A flower, showing the imbricate petals.
2. The same petals removed, showing the 10 subequal stamens.
3. The same, with the petals and stamens removed, showing the ovary with the short persistent style and 5 stigmas.
4. Anther, front and back view.
5. Ovary cut transversely, showing 5 cells.
6. The same cut vertically, showing the solitary pendulous ovules in each cell.

MICROMELUM. BL.

Gen. Char. Calyx 5-toothed or entire. Petals 5, valvate in the bud, or nearly so. Stamens 10, filaments linear subulate. Ovary 2 to 6, usually 5-celled, the dissepiments spirally twisted after the flowering ; style deciduous with a small capitate stigma ; ovules 2 in each cell, superposed. Fruit a dry berry. Seeds usually 1 or 2, testa membranous, albumen none ; cotyledons leafy, very much folded. Unarmed trees, leaves alternate, pinnate, with alternate oblique leaflets. Flowers small in terminal corymbose panicles.

MICROMELUM PUBESCENS, *Bl.*—A small tree, young branches, petioles, leaves and inflorescence more or less pubescent, leaves up to 20 inches long, leaflets 9-15 or rarely more, from ovate to broadly lanceolate, gradually acuminate, very oblique at the base, entire or slightly serrulate, sometimes becoming glabrous above, always pubescent beneath, 1½ to 6 inches long by ½ to 2¼ broad, petiolules about 2 lines long, corymbs terminal many flowered, flowers very short pedicelled, bractes very minute about 2 lines long, ovary usually hairy, berry size of a large pea yellow ovoid glabrous or pubescent, seed solitary conform to the berry. *Bl. Bijd.* 1. 137. Bergera integerrima, *Roxb. Fl. Ind.* ii. 376. Bergera villosa, *Wall.*

Vary. α. leaflets 5, 6 inches long 2-2¼ broad, flowers large.

Vary. β. leaflets 1½-3½ inches long by ½-1½ broad, flowers small.

The two varieties are very different in appearance. Variety α, which has broad large leaflets and much larger and broader flowers, I have only met with on the hills in the Vizagapatam and Ganjam districts, where it grows to be a small tree. Vary. β, with

narrow leaves and thin narrow flowers, is found in our western forests and in Ceylon, and also grows to a small tree; the latter closely resembles Murraya Kœnigii.

Analysis, Pl. VII, fig. 1.

MICROMELUM PUBESCENS.

1. A flower just opening, showing the valvate petals and very shortly lobed calyx.
2. A flower open, showing the 10 stamens alternately shorter.
3. Petal, inside view.
4. The same, outside view.
5. Stamen, front and back view.
6. Flower with the petals and stamens removed, showing the ovary seated on a disk, and the articulated style and stigma.
7. Ovary cut transversely, showing 4 cells, (5 is the normal number, but occasionally 2-7 occur.)
8. Ovary cut vertically, showing two superimposed ovules in each cell.

Drawn from specimens gathered on the Goomsur hills.

MURRAYA. LINN.

Gen. Char. Calyx 5 cleft. Petals 5, narrow, imbricate in the bud. Stamens 10, free; filaments subulate; anthers small. Ovary 2 to 5-celled. Style elongated, at length deciduous, stigma capitate. Ovules solitary or 2 in each cell, superposed, or nearly collateral. Berry 1 or 2-seeded. Testa glabrous or woolly; albumen none; cotyledons equal, not folded. Unarmed trees or shrubs, leaves pinnate, leaflets alternate, usually oblique at the base. Flowers often rather large, in terminal corymbs, or few together in the upper axils.

1. MURRAYA EXOTICA, *Linn.; Oliv. in. Journ. Linn. Soc. V, Suppl.* 28.—A shrub or small tree, glabrous, or the young branches and petioles pubescent, leaflets usually 5 to 7 from ovate, cuneate-obovate, or almost rhomboidal to ovate-lanceolate, $\frac{3}{4}$ to 2 inches long, coriaceous and shining when full-grown. Flowers white, very fragrant, in compact terminal sessile corymbs, or few together. Petals nearly $\frac{1}{2}$ inch long, erect at the base, spreading in the upper half. Ovary 2-celled. Berry globular or almost ovoid usually 2-seeded. *Wight. Ic. t.* 96.

Vary. *α.* peduncles many flowered.—M. exotica, *WA. Prod. p.* 94.

Vary. *β.* peduncles few flowered, flowers larger.—M. paniculata, *WA. Prod. p.* 94. M. Sumatrana, *WA. Prod. p.* 95.

This is a small tree or large shrub. Variety *α.* is only met with in gardens in this Presidency, but is wild in Bengal and China. Vary. *β* is very common throughout S. India and Ceylon, and it ascends the mountains to over 4,000 feet; the wood is very close grained and hard, and has been used as a substitute for box; it is also a very ornamental plant. Dr. Thwaites has found a variety or an allied species at Trincomallee in Ceylon, which he calls M. Glenieii, which only differs in having a 4-5 celled ovary.

2. MURRAYA KONIGII, *Spr.*—A small tree, leaflets alternate 10-20 obliquely lanceolate to ovate acuminate serrate pubescent furnished with numerous glandular dots, panicles corymbiform terminal, flowers small, calyx lobes triangular, ovary 2 celled, ovules solitary or sometimes twin obliquely superposed or almost collateral. *Spr. Syst. Veg.* ii. 315. Bergera Konigii, *DC.;—WA. Prod.* 94;—*Roxb. Fl. Ind.* ii. 375.

This small tree, universally known to the natives in this Presidency as the Karepàk, is common in jungles throughout S. India and in Ceylon, and is much cultivated in native gardens; the whole plant has a most peculiar odour, and the leaves are eaten both fresh and dried in curries; the leaves, bark, and root are used medicinally by the natives.

Analysis, Pl. VII, fig. 2.

MURRAYA EXOTICA.

1. A full flower.
2. The same, petals removed, showing the 10 subulate filaments alternately shorter.
3. Anther, front and back view.
4. A flower, petals and stamens removed.
5. Ovary cut vertically, showing a solitary ovule in each cell (2 are more usual).
6. A young fruit.

CLAUSENA. BURM.

Gen. Char. Calyx 4 or 5-cleft. Petals 4 or 5, broad, imbricate in the bud. Stamens 8 or 10; filaments dilated at the base or in the middle, anthers short. Ovary 4 or 5 celled, or rarely 2 or 3-celled; style deciduous, with an entire or lobed stigma; ovules 2 in each cell, collateral or superposed. Berry ovoid or oblong or globular, more or less succulent. Seeds with a membranous testa; no albumen; cotyledons plano-convex. Unarmed trees or shrubs, leaves pinnate with alternate, usually oblique leaflets. Flower small, usually clustered in terminal or axillary panicles or racemes.—Cookia *Sonner.*

CLAUSENA WILLDENOVII, *WA.*—A large shrub, branches glabrous or shortly pubescent, leaves $2\frac{1}{4}$-14 inches long, glabrous or more rarely pubescent, leaflets subsessile or on petioles (2-4 lines) long obliquely ovate to ovato-lanceolate, or narrow elliptic lanceolate, from quite rounded at the apex to acuminate, margin crenulate, 2-7 inches long, 1-2 inches broad, flowers in axillary cymose panicles or racemes, pedicels 1-5 lines long, calyx 4-5 parted or lobate, lobes more or less ovate; filaments 8-10 dilated in the centre subfornicate,

ovary seated on a stalk-like gynophore, globose verrucose with pellucid glands, style thick deciduous about as long as the ovary 4-5 celled, cells 2 ovuled, ovules obliquely superposed or nearly collateral, the funicles arising from nearly the same point on the axis, stigma 4 lobed, fruit more or less succulent size of a pea round or oblong. *WA. Prod. p.* 96 ;—*Oliv. in Aurant. p* 32. Amyris dentata, *Roxb. Fl. Ind.* ii, 249. (Small form) C. pubescens, *WA. l. c.* 96.

Common throughout the Peninsula and in Ceylon, a most variable plant ; in specimens from the Wynad (3,000 feet), the leaves are narrow, elliptico-lanceolate, very much attenuated at both ends, 7 inches long by 2 broad.

Vary. β. dulcis, Cookia dulcis. Bedd. Mad. Journal, 1861.

This is a tree 30 feet high, with a trunk several feet in girth, bearing a very delicious fruit as large as a large cherry, as succulent as a grape, and somewhat of the flavour of the black currant ; it is called by the Kaders Mor Kurangee ; it is abundant about Toonacodava (elevation 2000-3000 ft.), both in the moist and dry forests, and is in fruit from June till August. Specimens in flower were sent to Prof. Oliver, who pronounces it only a form of Willdenovii, so I will not attempt to separate it, but I believe it quite a distinct species. I have not got specimens at hand available for description, but the leaves and flowers I believe present no tangible characters distinct from Willdenovii ; the former are more membranaceous, highly odoriferous, more prominently dotted and very erose towards the apex. This tree I hope to figure in this work.

2. Clausena Indica, *Dalz.*—A small tree, ramuli puberulous, leaves 6-10 inches long, leaflets 7-11 oblique elliptical to ovato-lanceolate or lanceolate or exactly obovate, 1¼-2 inch long subcoriaceous crenulate or entire obtuse or slightly acuminate glabrous or minutely puberulous on the costa, flowers small pentamerous in terminal panicles, pedicels very short, petals oblong or elliptical, filaments dilated below, ovary globose or oblong glabrous, verrucose with pellucid glands, 3 (sometimes 4-5-2) celled, ovules 2 in each cell collateral, fruit 1 seeded spherical pulpy yellow nearly ½ an inch in diameter.—Piptostylis Indica, *Dalz. Kew Misc.* iii. *p.* 33. *tab.* 2. Bergera nitida, *Thw. En. Pl. Zeyl. p.* 46. Clausena Indica, *Oliv. l. c. p.* 36.

A small tree common in the Anamallay (moist forests) up to 5,000 feet, Bombay ghats and Ceylon, probably only a variety of No 1. Professor Oliver thinks it differs from C. Willdenovii in its constantly pentamerous flowers, terminal inflorescence and collateral ovules. The flowers of Willdenovii are very constantly pentamerous, and in dissecting a large quantity of flowers of both species, the ovaries appear to be quite similar, the funicles are always attached at or near the same point, and the ovules are more or less obliquely superposed or nearly collateral ; the inflorescence in Willdenovii is sometimes terminal, and I have specimens intermediate in foliage, which I am uncertain which species to refer to.

The Clausena Wampi (olim. Cookia punctata), a small Chinese fruit tree, is cultivated in gardens.

Analysis, Pl. VII, fig. 3.

Clausena Willdenovii.

1. A flower bud opening, petals very slightly imbricate at their margins or subvalvate.
2. An open flower, showing 10 stamens (8 often occur) alternately slightly shorter.
3. A petal.
4. Stamen, front and back view.
5. A flower, petals and stamens removed, showing the globose ovary papillose with wart like glands and slightly hairy, and the style which is deciduous soon after the petals, and the obsoletely 5 lobed stigma.
6. Ovary cut transversely, showing 5 cells (4 only when the stamens are 8.)
7. Ovary cut vertically, showing 2 superposed ovules in each cell, the funicles arise from nearly the same point above the middle of the axis, and 1 ovule is ascending and the other pendulous, in some ovaries the ovules are nearly quite collateral.

Dissections all taken from fresh specimens gathered at the foot of the Nilgiris.

LIMONIA, Linn.

Calyx 4-5 cleft, petals 4-5, stamens 8-10, filaments free subulate, dilated below, torus elevated forming a short gynophore to the ovary, ovary 4-5 celled, ovules solitary or twin collateral or obliquely superimposed ; style elongated deciduous, stigma obtuse, fruit baccate 4-5 (or by abortion fewer) celled, seeds solitary in each cell, surrounded with mucilage. Trees or shrubs, spinose, leaves 3 foliate or pinnate.

Limonia alata, *WA.*—A small tree, glabrous armed with long nearly straight thorns (1 inch long), leaves trifoliate 2½-3½ inches long, leaflets cuneate obovate, quite entire 1-2½ inches long, petiole winged 1-1½ inches long, petiolules scarcely any, racemes terminal, calyx 5 lobed, lobes triangular, petals 5 free imbricate, stamens 10 (or 8) subequal, filaments linear subulate, anthers linear oblong, disk small annulate, ovary 5-4 celled, cells 2 ovuled, ovules pendulous collateral or obliquely superimposed, style continuous a little longer than the ovary, stigma capitate, berry globose about 1 inch in diameter, seeds many, cotyledons fleshy equal or subequal. *WA. Prod. p.* 92 ;—*Oliv. l. c. p.* 27.

Common about the jungles at the foot of the Nilgiris and Anamallays, and elsewhere in the western forests of this Presidency and in Ceylon. The wood is hard and strong, and used by the natives for building purposes, &c. and for ploughs.

2. Limonia acidissima, *L.*—A small tree or a shrub armed with straight thorns nearly ½ an inch long, leaves irregularly pinnate with 2 3 pairs of small opposite sessile leaflets and a larger terminal one, all punctate with pellucid dots, oblong retuse crenated, rachis of the leaf broadly winged, flowers small in few flowered generally leafy axillary racemes, calyx 4 cleft or lobate, lobes ovato-rotundate or triangular, petals 4 free oblong or elliptic, stamens 8 free subequal, filaments subulate, anthers cordato-oblong, disk annular

or shortly stipitate, ovary 4 celled, ovules solitary in each cell pendulous, style short thick, stigma obtuse, fruit globose 1-4 seeded. *Linn. Gen. Pl.* 534. Limonia crenulata, *Roxb. Fl. Ind.* ii. *p.* 381. Hesperethusa, *Rœm.*

Very common throughout India and Birmah, but not in Ceylon, it does not ascend the mountains to any elevation, the wood is hard and close grained and adapted for the lathe, the tree is called Tor-elaga in Telugu.

Analysis, Pl. VII, fig. 3.

LIMONIA ALATA.

1. A flower, showing the pubescent calyx-segments slightly imbricate at the base or subvalvate, and the imbricate slightly hairy petals.
2. The same open, showing the 10 subequal stamens.
3. A petal.
4. Anther, front and back view.
5. A flower, petals and stamens removed, showing the ovary seated on an annular disk and the 4 stigmas.
6. The ovary cut vertically, showing the 2 obliquely superimposed ovules attached to nearly the apex of the axis.
7. The same cut transversely (much magnified), shewing the 5 cells.
8. A fruit.
9. A flower bud.

Drawn from fresh specimens gathered at foot of Nilgiris.

ATALANTIA. CORR.

Gen. Char. Calyx 3 to 5-cleft, or at the time of flowering irregularly split to the base. Petals 3 to 5, imbricate in the bud. Stamens twice as many or rarely more, free or irregularly united at the base, anthers ovate or oblong. Ovary 2 to 5-celled ; style deciduous, with a capitate stigma : ovules solitary or 2 in each cell, collateral or rarely superposed. Berry globular, with a thickened rind 1 to 5-seeded. Seeds obovoid or oblong testa membranous, albumen none ; cotyledons flat or convex, more or less fleshy. Shrubs or small trees, unarmed or thorny. Leaves 1-foliate coriaceous. Flowers in axillary clusters or short racemes or small, cymose panicles, occasionally solitary.—Sclerostylis, *Blume.*

ATALANTIA MONOPHYLLA, *Corr.*—A small tree or a shrub, bark greenish, thorns small strong sharp sometimes wanting, leaves ovate or oblong more or less emarginate at the apex, 2-3 inches long by 1-1½ broad, racemes axillary short sessile, calyx at the time of flowering irregularly cleft to the base, margins scariose, stamens 8 (rarely 5-7) joined into a tube free and subulate just at the apex, ovary generally 4, (rarely 3-5) celled, ovules solitary or twin, style at first continuous with the ovary, after flowering deciduous leaving a scar ; berry size of a nutmeg exactly like a very small lime 1-4 seeded. *Corr* ;—*DC.* 1. 535 ;—*WA. Prod.* 91. A. floribunda, *Wight Ic. tab.* 1611. A. platystigma, *Wight Ill.* 1. 108. L. monophylla, *Linn.* Trichilia spinosa, *Willd. Sp. Pl.* ii. 554 ;—*DC. Prod.* 1. 623.

A small tree common in many parts of our Presidency and in Bengal and Ceylon, in the Northern Circars it is called Arawinim (jungle lime) the wood is very hard and close grained.

2. ATALANTIA RACEMOSA, *WA.*—A shrub or very small tree, thorns large, leaves ovate or oblong more or less emarginate, racemes axillary, flowers subsessile or pedicelled few or dense, flower buds globose, flowers 4-merous (rarely 3-merous), stamens 8, filaments free or joined into a tube almost quite to the apex or irregularly united, ovary 2-3 celled, ovules twin, fruit globose small. *WA. Prod.* 91. Sclerostylis racemosa, parvifolia et ovalifolia, *Wight Ill. p.* 109.

A variable plant much like No. 1, common about our western forests and in Ceylon.

3. ATALANTIA CEYLANICA, *Wight.*—A small tree, glabrous armed or without thorns, leaves ovato-lanceolate oblong or elliptic to rotundate acute or somewhat obtuse and slightly emarginate at the apex, flowers tetramerous axillary or terminal fascicled or racemed, calyx more or less 4 lobed, filaments free or 2, 3 more or less united together, disk annulate subcupulate, stigma clavate, ovary more or less stalked 2 celled, ovules twin.—Scelerostylis Ceylanica, *Wight. Ill. p.* 109. S. Arnottiana, *Wight l. c.* Rissoa Ceylanica, *Arnt. Pug. Pl. Ind. Or.* 6. S. rotundifolia.

Ceylon, up to 4-5,000 feet elevation—Nilgiris ?

4. ATALANTIA MISSIONIS, *Wall.*—A small thorny glabrous tree or shrub, thorns solitary or in pairs, leaves elliptic oblong, about 3 inches long by 1½ broad, petioles ¼ inch long, racemes in the axils of the spines many flowered somewhat capitate much shorter than the leaves, flowers tetramerous (rarely pentamerous), filaments free, ovary 4 (rarely 5) celled, cells 2 ovuled, ovules pendulous collateral. *Oliv. l. c. p.* 25. Limonia Missionis, *Wall. Cat.* 6358 ;—*WA. Prod. p.* 92.

Anamallay hills, 2,000 feet, and elsewhere on western side of the Presidency, Cuddapah and N. Arcot hills and Eastern Ghats, also in Ceylon.

Analysis, Pl. VII, fig 5.

ATALANTIA MONOPHYLLA.

1. A flower, showing the irregularly ruptured calyx.
2. A flower open, showing the 4 petals, and 8 stamens combined into a tube.
3. A petal.

4. Calyx tube open and petals slightly connate round its base.
5. A calyx.
6. Anther, front and back view.
7. A flower, petals and stamen tube removed, showing the ovary seated on an annular disk.
8. Ovary cut transversely, showing its 4 cells.
9. Ovary cut vertically, showing the solitary ovules peltately attached to the centre of the axis.

Drawn from fresh specimens gathered on the Nilgiris.

CITRUS. Linn.

Gen. Char. Calyx 3 to 5-lobed. Petals 4 to 8, thick, imbricate in the bud. Stamens indefinite, usually numerous, filaments flattened at the base and variously connate, anthers oblong. Disk large, cupular or annular. Ovary of 6 or more cells; style deciduous, with a capitate lobed stigma, ovules 4 to 8 in each cell, in 2 rows. Berry globular or oblong, with a thickened rind, several celled, with thin dissepiments, the cells more or less filled with transverse pulpy cellules. Seeds with a coriaceous testa; albumen none, embryo often more than one; cotyledons fleshy, plano-convex. Trees or shrubs, often armed with axillary spines. Leaves 1-foliolate, the petiole often winged. Flowers white, axillary, solitary clustered or shortly paniculate.

The species of this widely cultivated genus are so very variable that they have puzzled all botanists; all the Indian varieties may be referred to 2 species, viz., *C. decussana*, Linn. (the pomaloe), and *C. aurantium* (the orange,) the lemon, the sweet lemon, the lime, the sweet lime, the citron, and the different oranges, all being considered as varieties of the latter; they are all in cultivation in this Presidency, and several varieties of the C. aurantium are quite wild in our forests, particularly on the mountains.

Analysis, Pl. VII, fig. 6.

Citrus. sp.

1. A flower bud opening, showing the calyx and 4 imbricate petals.
2. A male flower opened, showing the numerous polyadelphous stamens.
3. A fertile flower, petals and stamens removed, showing the ovary seated in the cup-like disk.
4. A male flower, showing the abortive ovary and the attachment of the stamens, which are usually polyadelphous and mixed with some quite free ones.
5. A bundle of stamens.
6. Anthers, front and back view.
7. Ovary cut vertically, showing the numerous ovules in 2 rows in each cell..
8. The same cut transversely, showing the 9 cells.

Drawn from flowers in spirits, collected from a small tree found in the Gumsoor hill forests; it is polygamous (some flowers being only male), a very unusual occurrence in this tribe.

FERONIA. Corr.

For Gen. Char. see letter press to plate of this tree.

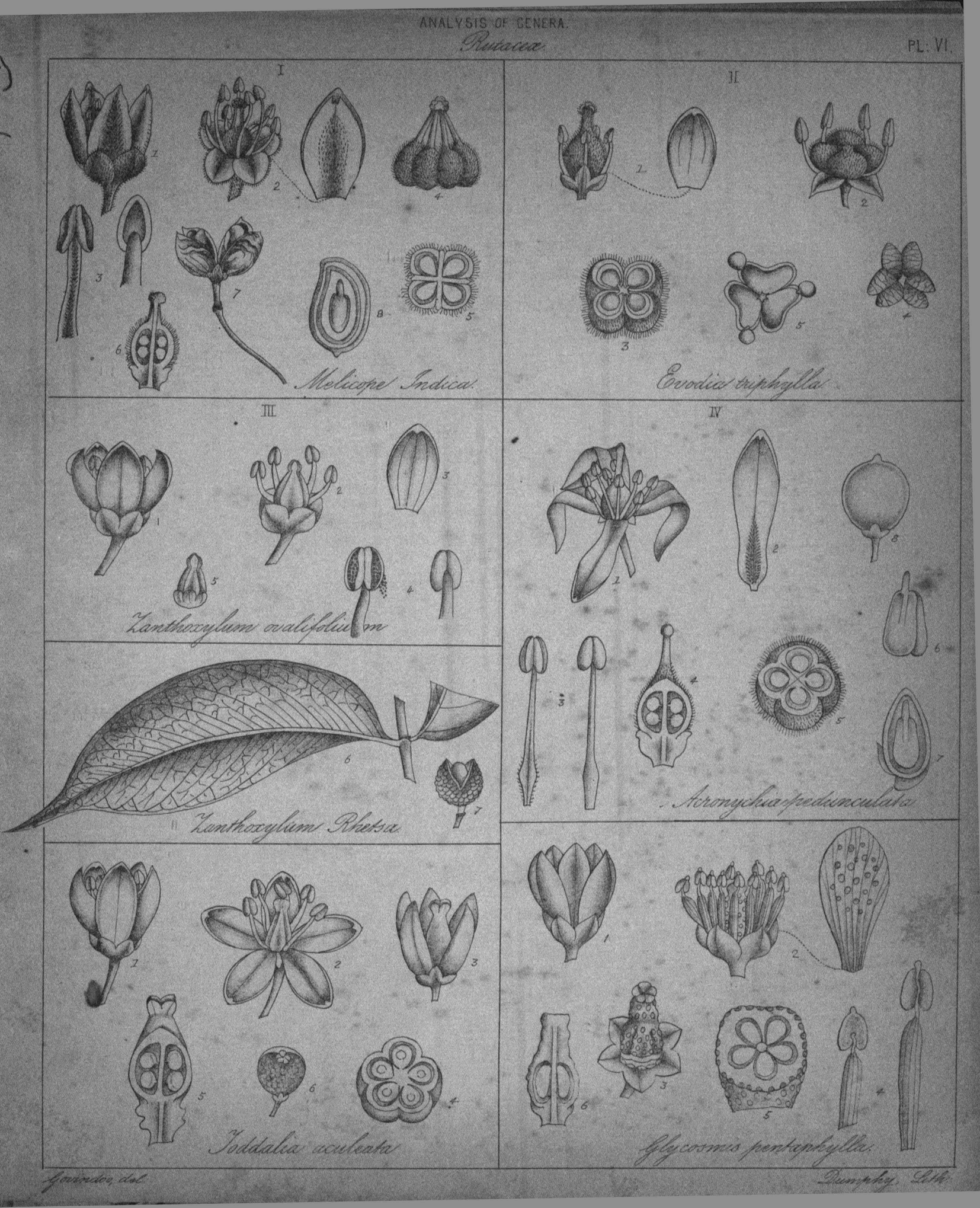
1. Feronia Elephantum, *Corr.*—For description, &c. see plate.

ÆGLE. Corr.

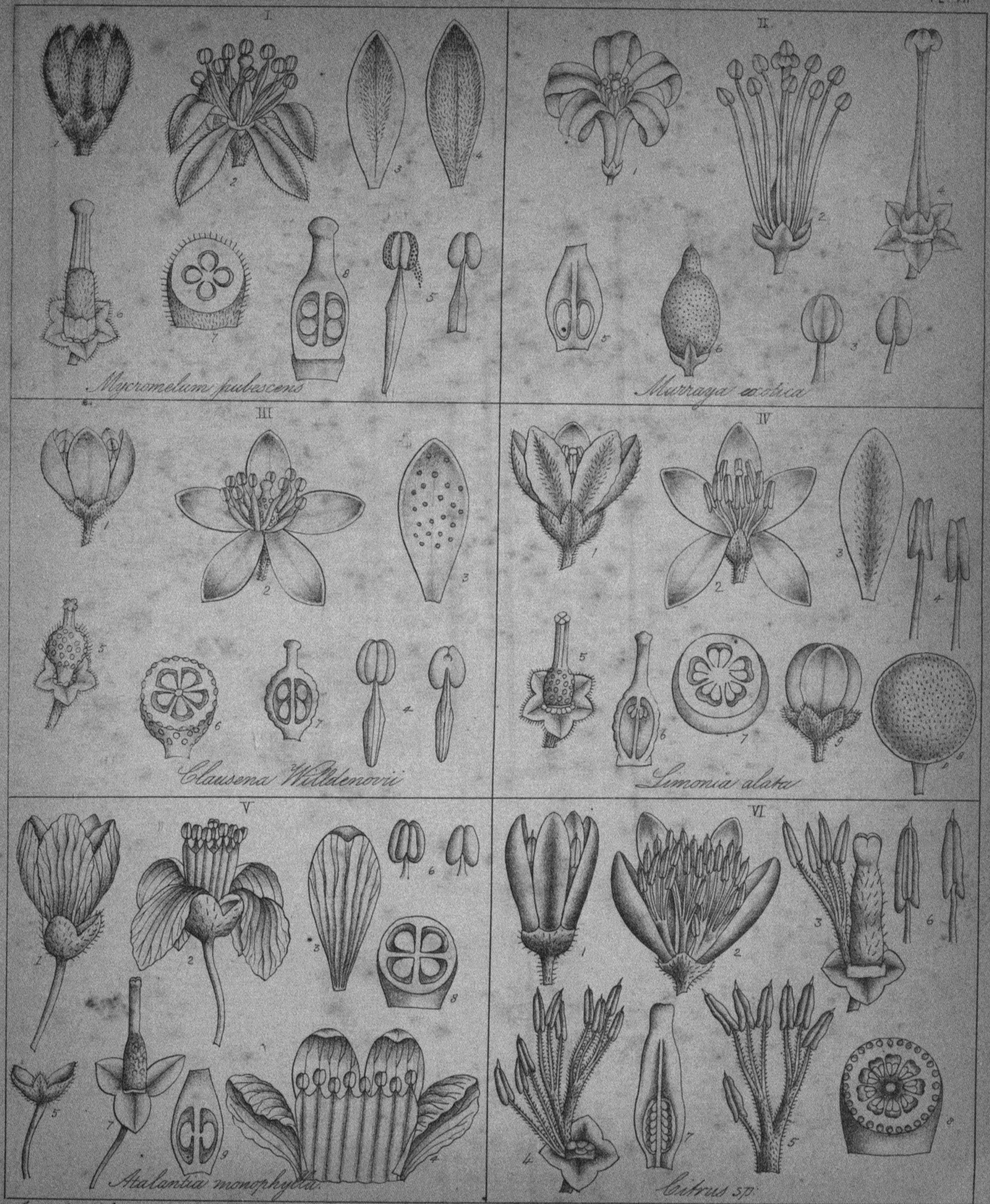
For Gen. Char. see letter press to plate cxxi.

1. Ægle marmelos, *Corr.*—For description, &c., see plate cxxi.

Luvunga.—*A scandent genus is represented in this Presidency by 2 creepers, L. scandens (Ham.) and L. eleutherandra (Dalz.) both being found in the Anamallay forests and elsewhere on the western side of the Presidency, and in Ceylon. Peramignya, also a scandent genus has 2 representatives, P. monophylla (Wight) and P. armata (Thw.) both common throughout our western forests and in Ceylon. Triphasia trifoliata (DC.) a thorny shruba or tree from China, occurs in gardens in Madras, it has 3-foliate leaves, trimerous flowers, 6 free stamens, a deciduous style and solitary ovules.*



Gourdon, del. Dumphy, Lith.



Govindoo, del.

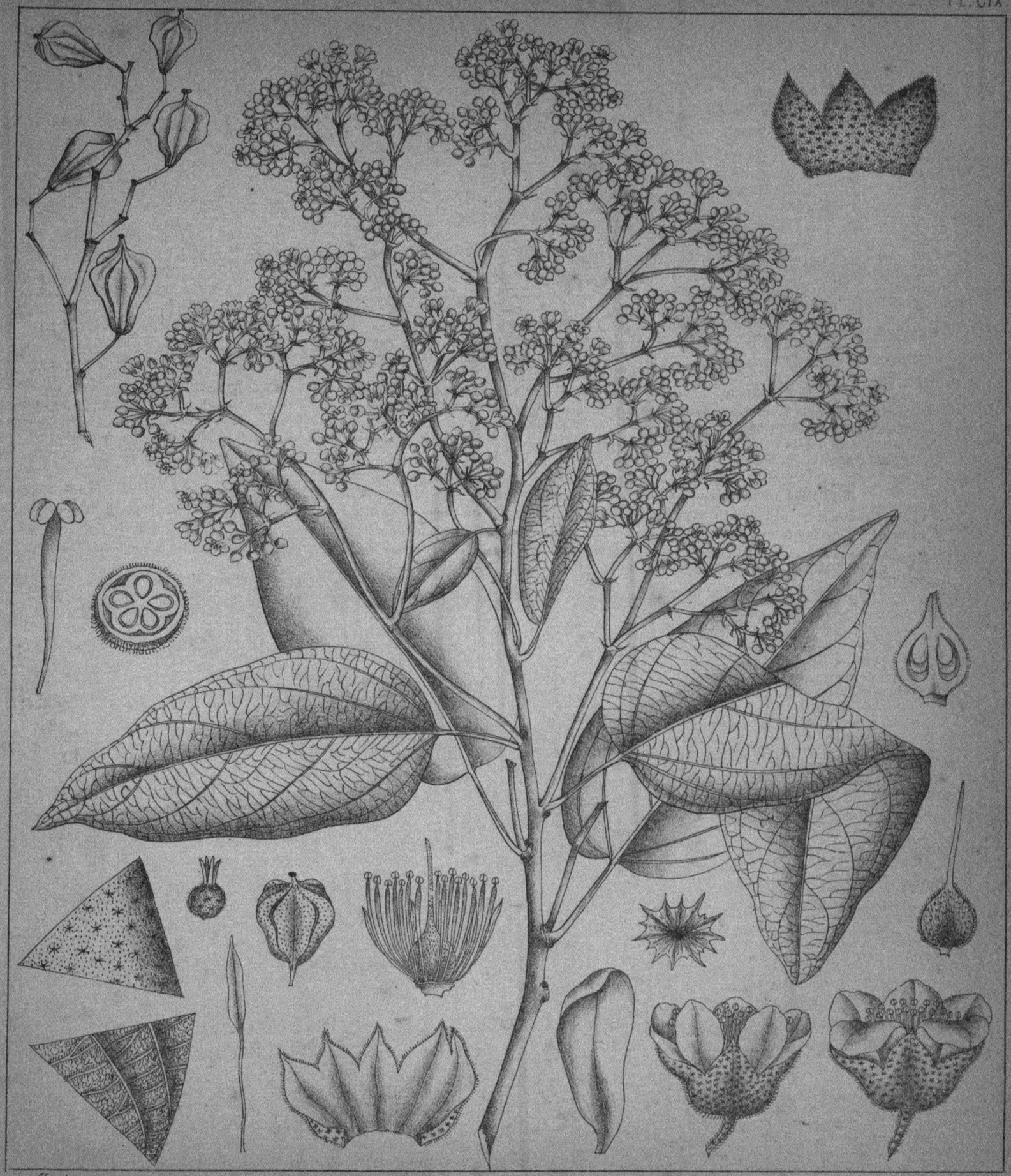
Dunnicliff, Lith.

PITYRANTHE VERRUCOSA. (Nat. order Tiliaceæ.)

PITYRANTHE. *Thw.*—GEN. CHAR. Calyx urceolate campanulate, 3-4 lobed, petals 5 rather broad naked inserted round the base of the torus, fertile stamens about 15 inserted on to the torus free or obscurely 5 adelphous, staminodia 5 shorter than the stamens and inserted with them spathulate upwards, anthers adnate, cells divaricate, ovary 5 celled, cells 2 ovuled, styles 5 in the young bud afterwards closely united into one and filiform, capsule inflato-turbinate 5 angled loculicidally 5 valved, 1 seeded by abortion. A tree, leaves ovate or obovate crenate, flowers small in terminal panicles. *Thw. En. Pl. Zeyl. p.* 29.

PITYRANTHE VERRUCOSA. (Thw.) A tree, leaves ovate to obovate, inconspicuously crenate penninerved or sub 3 nerved, above sparingly furnished with tufts of stellate hairs at length glabrous, beneath whitish with dense close pressed tomentum, 2-6 inches long by 1-3 broad, petiole ½-¾ inch long, panicles terminal lepidote, flowers numerous 1½ line long, capsule furfuraceous verrucose, seed black oblong 2 lines long very minutely reticulated covered with pale deciduous stellate pubescence. *Thw. En. Pl. Zey. p* 29. Kleinhovia verrucosa, *Gardn. MS.*

A tree found only in Ceylon, abundant in the Batcaloa district, and at Jaffna and Trincomalee.



Abeix del. Dumphry Lith.

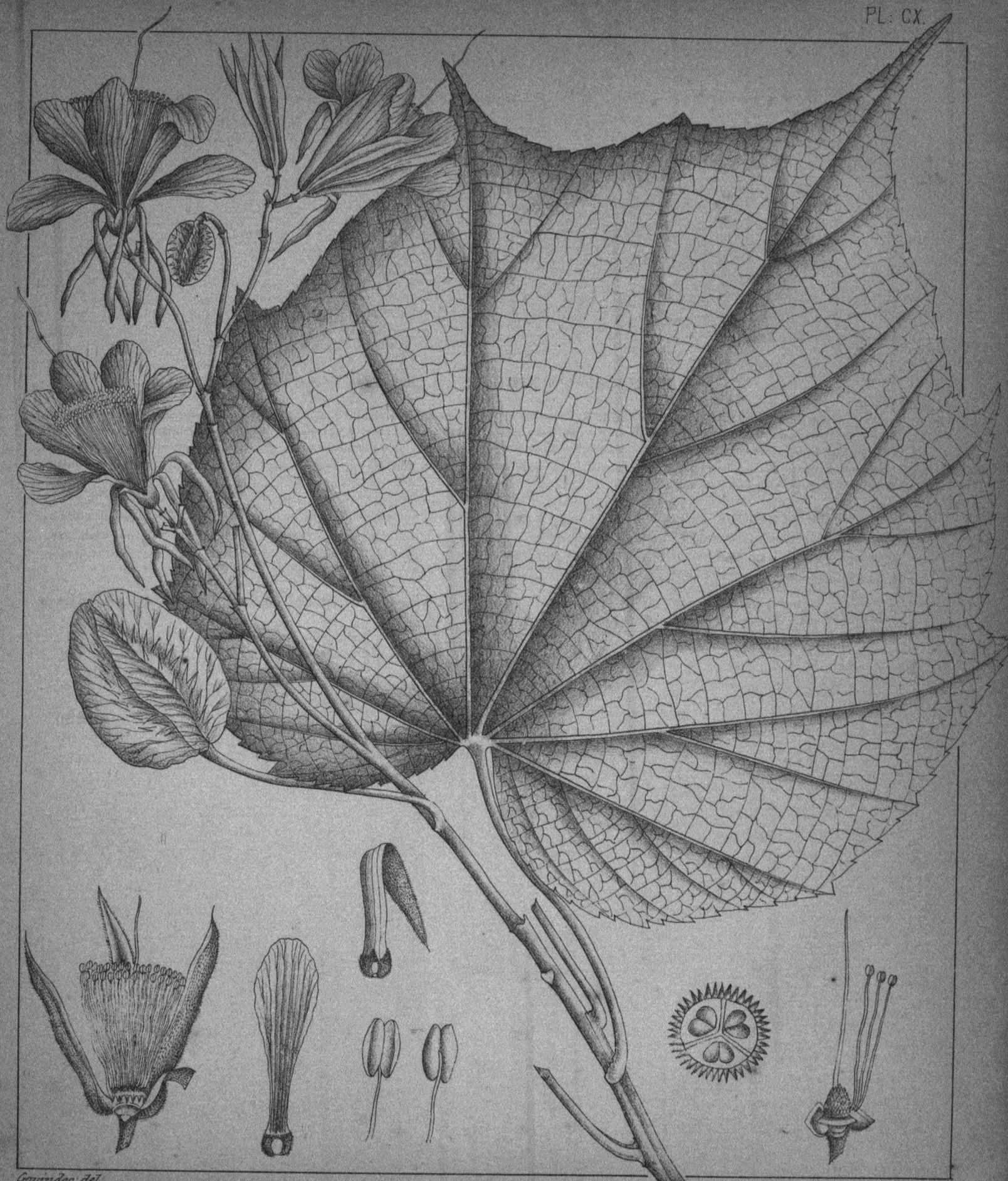
Petyranthe verrucosa (Thw.)

ERINOCARPUS NIMMONII. (Nat. order Tiliaceæ.)

ERINOCARPUS. *Nimmo.*—GEN. CHAR. Sepals 5 distinct, petals 5 with pit like glands at the base on the inside, inserted round the base of the torus, stamens numerous inserted on the elevated torus free or the exterior very shortly connate in a ring, ovary 3 celled, cells 2 ovuled, style filiform, fruit large rather woody indehiscent triquetrous, and slightly winged, echinate, seed pendulous oblong, testa coriaceous, albumen fleshy, cotyledons ovate plane. A tree, leaves broad palminerved lobate and toothed, flowers yellow large laxly arranged on large panicles, bractes cordate. *Nimmo in Hort. Bombay*;—*Benth. and Hook. Gen. Pl.* 1. 234.

ERINOCARPUS NIMMONII. (Grah.) A small tree, leaves roundish cordate, irregularly serrate 5-7 lobed, lobes acute, prominently palmately 9 nerved, glabrous above pubescent beneath or in age subglabrous except the veins, about 8 inches each way, petioles 3-5 inches long, flowers nearly 2 inches across, yellow in terminal panicles, calyx stellately pubescent on the outside, ovary pubescent, fruit pubescent and echinate, about 2 inches long. *Grah. in Cat. Bombay Pl. p.* 21.

This tree is common on the Concan ghats, and probably occurs in Canara; it flowers in September and October, and is called Chowra or Jungli Bendi. The bark is used for making ropes.



Govindoo, del.

Dumphy. Lith.

Erinocarpus Nimmonii, Grah.

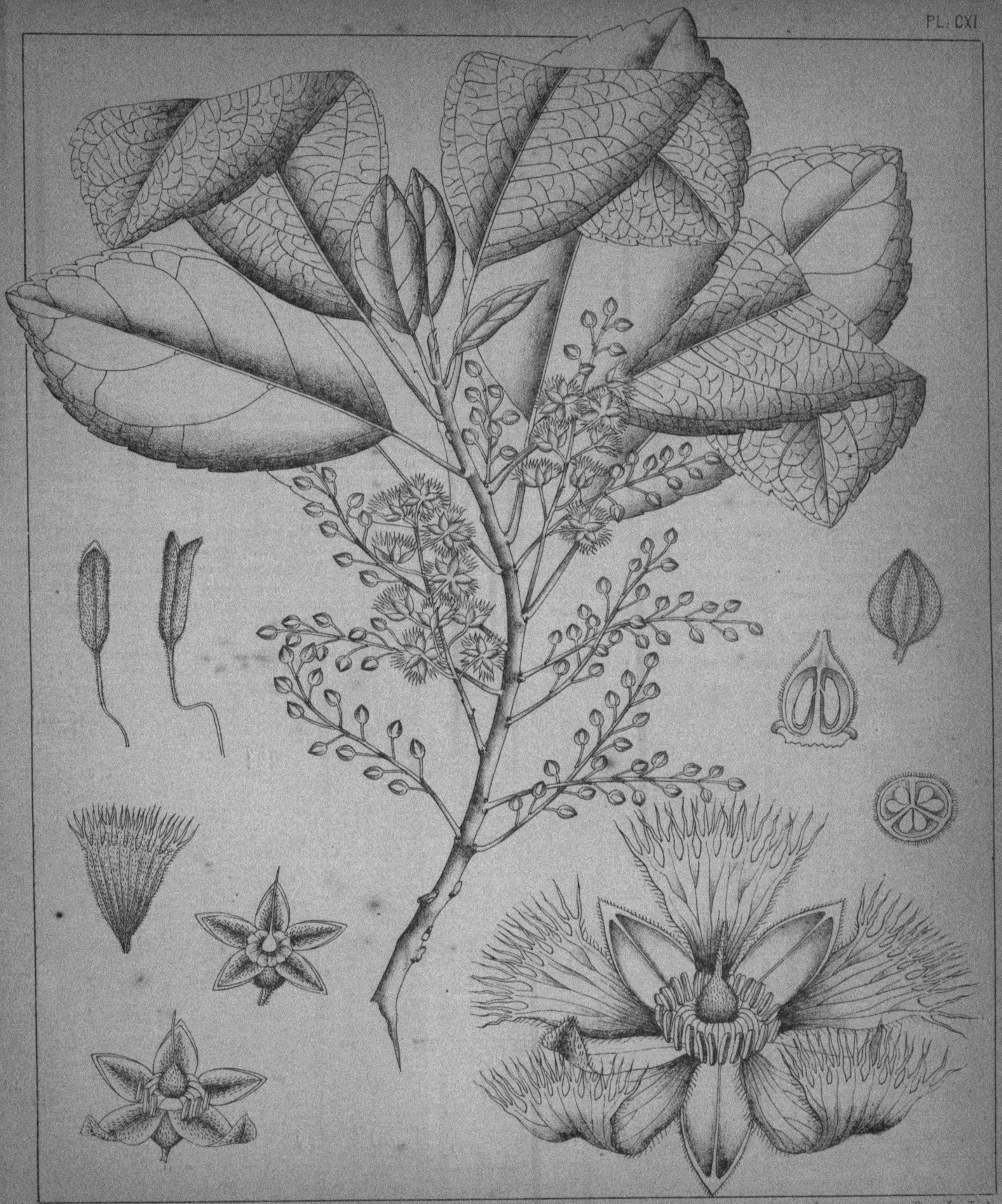
BENGAL SECRETARIAT
LIBRARY.

ELÆOCARPUS AMÆNUS. (Nat. order Tiliaceæ.)

ELÆOCARPUS. *Linn.*—GEN. CHAR. Sepals 4 or 5, usually valvate. Petals as many, fringed, lobed or rarely entire, inserted round the base of the torus, induplicate-valvate, and embracing some of the outer stamens in the bud Stamens indefinite, inserted on the torus within a glandular ring, anthers oblong or linear, opening at the top in 2 valves (that is, the cells placed back to back and opening in short, terminal, confluent slits.) Ovary 2 to 5 celled, with 2 or more ovules in each cell, style subulate. Fruit a drupe, with a hard often bony putamen, 2 to 5 celled or 1 celled by abortion. Seeds solitary in each cell, pendulous (or rarely erect ?), testa hard, albumen fleshy, cotyledons broad, flat or undulate. Trees, leaves alternate or rarely opposite, entire or serrate. Flowers in axillary racemes, sometimes polygamous. (Monocera, *Jack.*)

ELÆOCARPUS AMÆNUS. (Thw.) A middling sized tree, glabrous except the young leaf buds, leaves ovate or ovato-lanceolate with a short blunt or retuse point, crenate-serrate, furnished with glands in the axils of the leaves beneath, 2-4½ inches long by ¾-2 broad, petioles 4 lines to 1 inch long, racemes puberulous very numerous towards the end of the branches, axillary and from the axils of fallen leaves, anthers quite naked, deeply cleft at the apex, each petal cut down at the apex about ⅓ of its length into about 8 segments each with 2-4 fringed points, ovary 3 celled, ovules 2 in each cell attached about the centre of the axis, drupe spherical. *Thw. En. Pl. Zey. p.* 32.

This very beautiful tree is common in the central provinces of Ceylon up to 4000 *feet, and is also cultivated in gardens.*



Covington del. Dumphy, Lith.

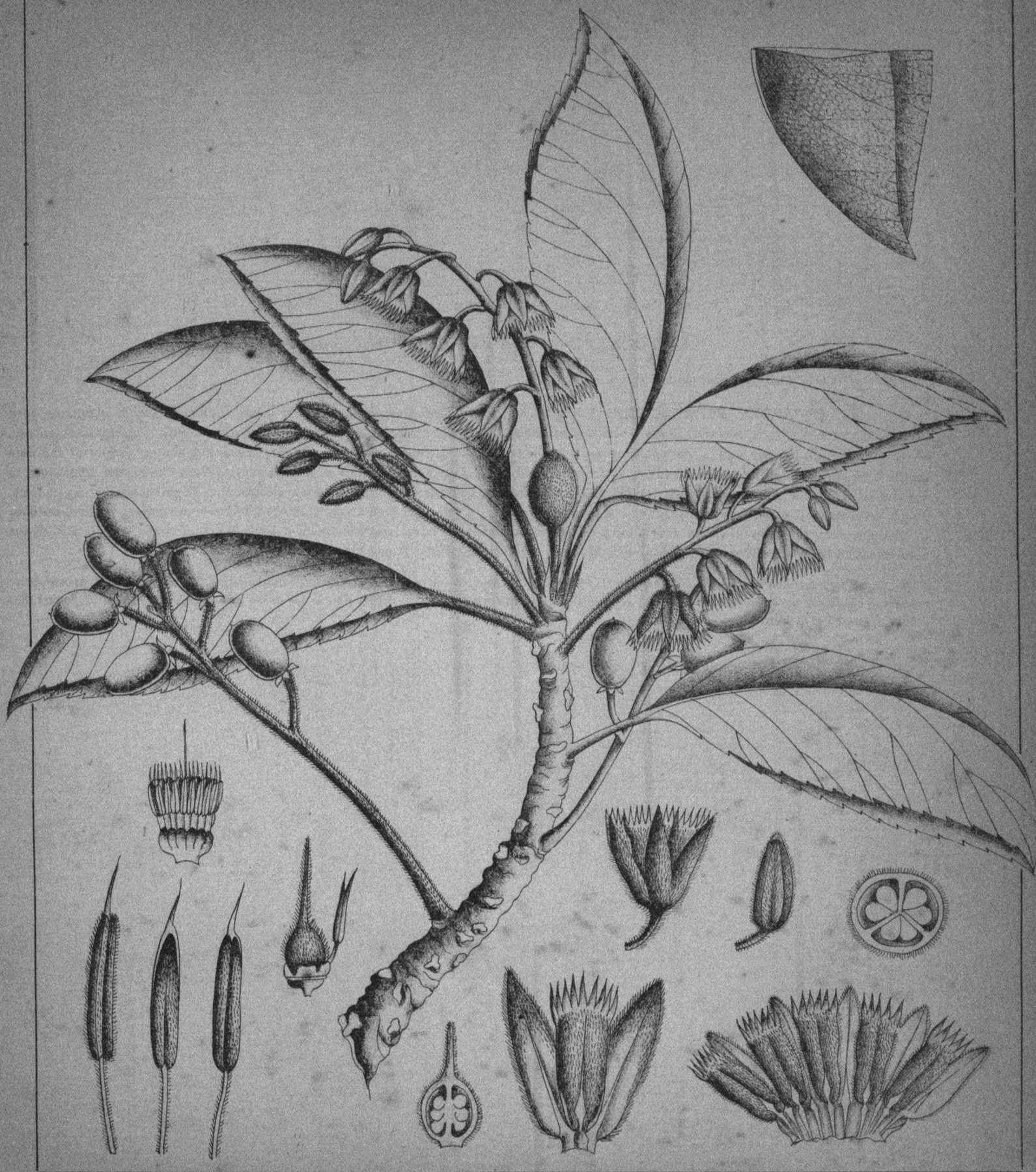
Elaeocarpus amanus, Thw.

ELÆOCARPUS FERRUGINEUS. (Nat. order Tiliaceæ.)

For Gen. Char. see letter press to Pl. cxi.

ELÆOCARPUS FERRUGINEUS. (Wight.) A good sized tree, young shoots densely villous, leaves cucullate very coriaceous ovate to elliptic serrulate, with a bluntish rather sudden point at the apex, at first villous above with fugacious tomentum, at length glabrous, densely and closely tomentose beneath, stipules linear acute glabrous viscid and shining above, downy at the base on the back, early caducous, racemes axillary or from the old axils just below the leaves, a little shorter than the leaves, tomentose as are the calyx, petals and ovary, flowers less than ½ an inch long, pedicels about the same length drooping slightly elongating in fruit, petals involute at the margins furnished with a prominent ridge up the inner face about 9 fringed but not otherwise, divided, anthers puberulous along the cells furnished with a long awn from the exterior valve, ovary 3 celled, ovaries 6-8 in 2 rows in each cell, drupe oval smooth a little more than ½ an inch long. Monocera ferruginea, *Wight Icones tab.* 225.

A very common tree on the Nilgiris, Anamallays and Pulneys, at the higher elevations. The margins of the leaves are always connivent, rendering the leaves quite boat-shaped. The timber is used for building purposes. Wight figures the ovary as 4 celled, but in several flowers that I have dissected it is 3 celled.



Gerrido, del. Dempsey, Lith.

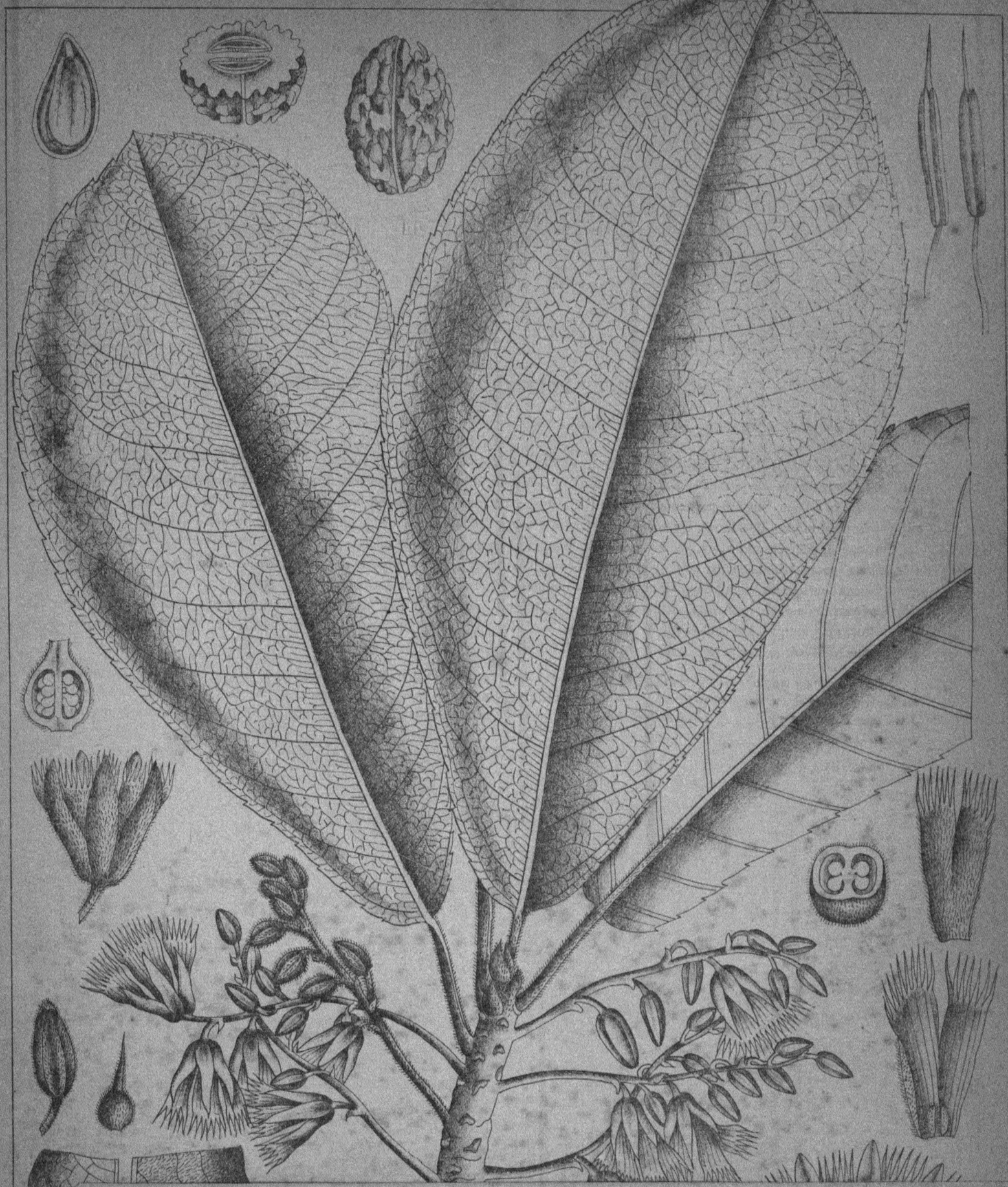
Elæocarpus ferrugineus (Wight)

ELÆOCARPUS TUBERCULATUS. (Nat. ord. Tiliaceæ.)

For Gen. Char. see under "Elæocarpus amœnus," Pl. cxi.

ELÆOCARPUS TUBERCULATUS. (Roxb.) A gigantic tree, leaves crowded about the apex of the branchlets, obovato-oblong remotely and inconspicuously serrulate, gradually narrowed into a retuse base very broad towards the apex and obtusely pointed, glabrous above villous beneath particularly along the veins, 8-12 inches long by 4-5 broad, petioles 1-2 inches long round and villous, stipules conical villous deciduous, racemes numerous just below the leaves (from the axils of fallen leaves) 3-4 inches long villous as are the bractes, pedicels and calyx, pedicels short drooping 1 flowered, bractes lanceolate caducous 1 to each flower, flowers pure white 1 inch long, petals villous on the back glabrous inside except at the 2 oblong glands at the base, each one bifid for nearly half its length the divisions overlapping, many fringed, anthers very numerous 70-80, each with a long terminal beak from the exterior valve, ovary 2 celled, ovaries numerous in 2 rows, drupe size of a small apple, nut woody oval slightly compressed much tubercled on its flat sides with a thickened margin, 1-2 celled. *Roxb. Fl. Ind.* iii. *p.* 594. Monocera tuberculata, *Wight. Ic. tab.* 62. E. serrulatus, *Roxb Hort. Bengh. p.* 42. E. bilocularis, *Roxb. in E. I. C. Mus. tab.* 1. 985.

This truly magnificent tree is very common in Coorg, the Annamallays, Malabar and Travancore, up to an elevation of about 4.000 *feet, and probably throughout our western forests. Very large trees of it may be seen in the dense forests about the foot of the Nilgiris below Makurty Peak and Banghy tappal ; it is called Roodrack, and the beads are worn as ornaments, and by fakeers. I am not acquainted with the timber, but it is worth attention.*



LEPTONYCHIA MOACURROIDES. (Nat. order Tiliaceæ.)

LEPTONYCHIA. *Turcz.*—GEN. CHAR. Sepals 5 distinct valvate in bud, petals 5 glandular at the base very small inserted round the base of the torus alternate with the sepals, imbricate in bud, staminal tube short embracing the base of the ovary, fertile stamens 10 in pairs in the sinuses of 5 small tooth like staminodia, each fertile filament being also furnished with a long sterile filament attached at its back about ⅓rd from the base, anther cells parallel at length divaricate, ovary 4 celled, ovules numerous in 2 rows attached to the axis, style simple, stigma obscurely 2 fid, fruit verrucose and densely downy dehiscent, by abortion 3 celled, cells 1 seeded, seed covered with a red spongy aril, albumen horny, embryo straight, radicle pointing to the hilum. Trees or shrubs, leaves entire glabrous, flowers small in short axillary cymes.

LEPTONYCHIA MOACURROIDES. (Bedd.) A small tree with much the appearance of a Grewia, leaves glabrous on both sides penninerved or sub 3 nerved at the base, oblong with a long gradually fine acumination, about 4 inches long by 1¾ broad, petioles 3-4 lines long, stipules small lanceolate early caducous, flowers in axillary cymes about the length of the petioles, calycine segments linear lanceolate pubescent, petals nearly orbicular not more than ¼th the length of the sepals densely villous except at the base inside, ovary and style pubescent, fruit about ¾ of an inch each way slightly 2 lobed verrucose and covered with down (and much like that of Moacurra gelonioides).

An elegant small tree inhabiting the western coast forests of the Madras Presidency, 1,000 *to* 3,000 *feet elevation. I have met with it on the Carcoor ghat in the Wynad, on the Coimbatore hills, and on the Tinnevelly ghats.*

Gourlie del. Dunning Lith.

Leptomyrtus mercurioides, Hooker.

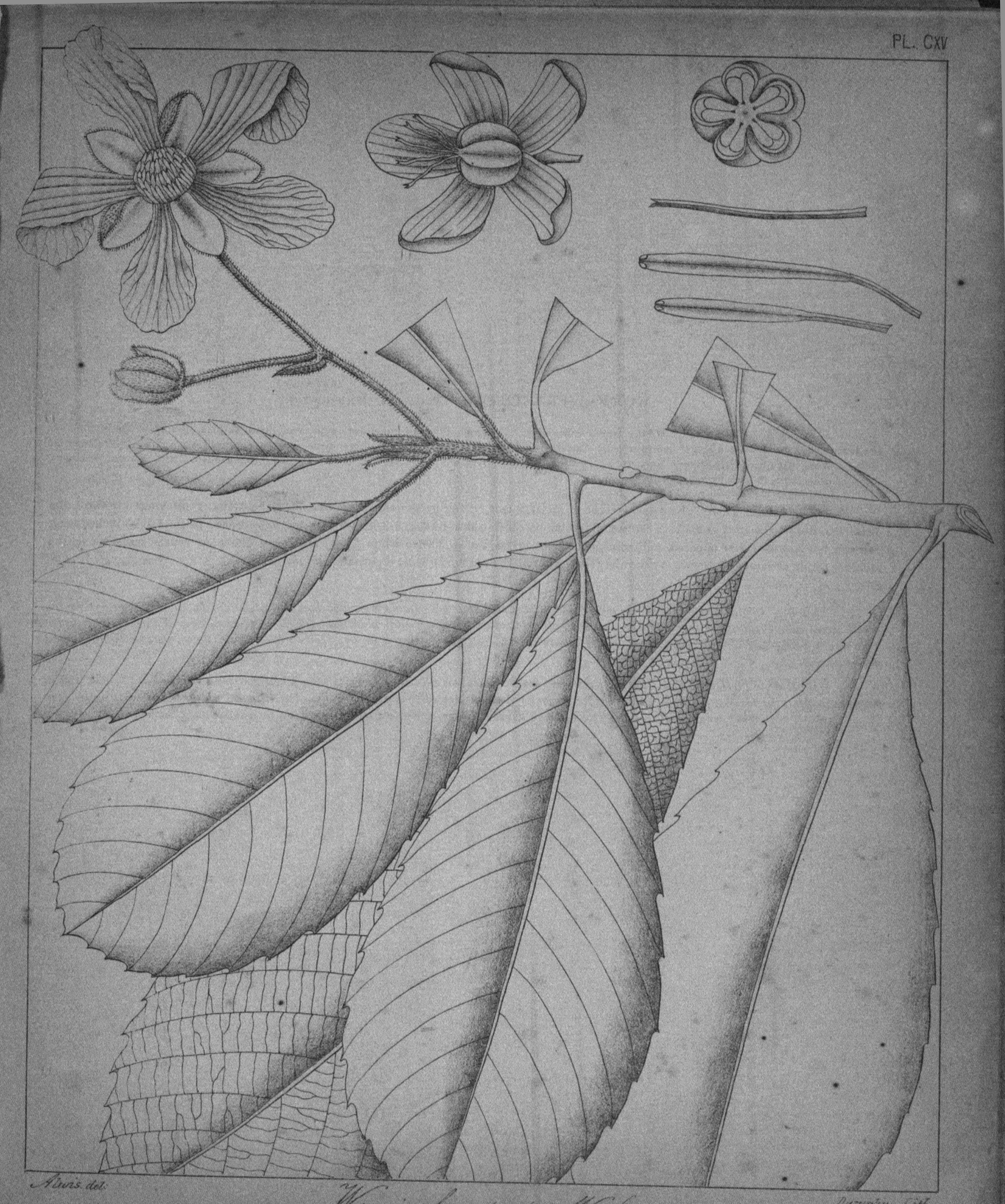
WORMIA BRACTEATA. (Nat. ord. Dilleniaceæ.)

WORMIA. *Rottl.*—GEN. CHAR. Sepals 5 spreading. Petals 5. Stamens numerous, with erect linear anthers opening at the summit in two pores, the inner ones often longer and recurved. Carpels 5 to 10, scarcely cohering, with several ovules in each, dehiscent when ripe. Seeds with an arillus. Trees, often very lofty, leaves large, with raised parallel veins diverging from the midrib, the petioles often bordered with narrow deciduous wings, flowers large, in loose terminal panicles.

WORMIA BRACTEATA. (Wight.) A large tree, young parts sericeous, leaves obovate gradually attenuated towards the base, rounded at the apex crenate or serrate, glabrous on both sides in age, 3-8 inches long by 3-3½ broad, petioles 1-1¼ inches long, racemes few flowered, leaf opposed, pubescent, shorter than the leaves, flowers white 2½-3¼ inches in diameter, sepals sericeous on the outside, petals obovate, ovaries 5, styles minutely 2 cleft at the apex. Dillenia bracteata, *Wight Icones tab.* 358. Wormia, *H. f. et T. Flora Ind. p.* 68.

This very handsome tree I have only observed on the Coimbatore hills and the Anamallays, but it is also found in Mysore and on the North Arcot and Cuddapah hills. It is well deserving of cultivation for ornamental planting, &c. The specimen figured was collected in the Bolamputty valley on hills near Coimbatore, and I believe I am correct in referring it to Dr. Wight's species; his figure however is not as good as his description.

WORMIA TRIQUETRA. (Rottl). A Ceylon tree very like this species, differs in its much broader leaves rounded at the base, and in its more numerously flowered glabrous peduncles; the young petioles are curiously sheathed in the stipules, which latter are however soon deciduous. It is a highly ornamental tree and very common about Colombo, and might receive attention for ornamental planting.



Atkins del.

Wormia bracteata (Wight)

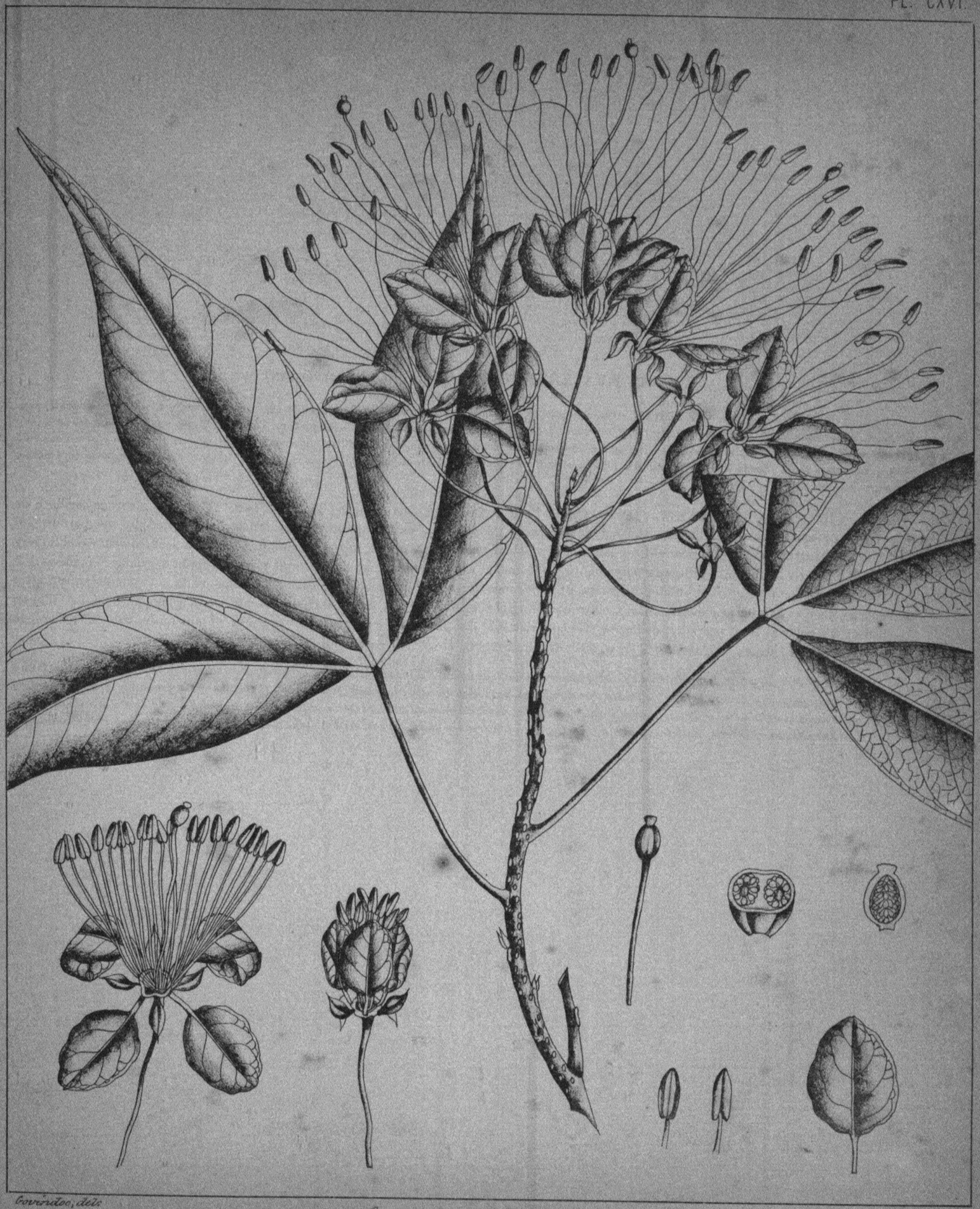
Dampier Lith.

CRATÆVA RELIGIOSA. (Nat. ord. Capparidaceæ.)

CRATÆVA. *Linn.*—GEN. CHAR. Calyx 4-partite; lobes distinct from the base and open in æstivation. Petals 4, elliptical or ovate, penniveined, with a long claw. Stamens usually 16-20, inserted on the more or less dilated torus; filaments free filiform. Ovary ovoid or globose on a long gynophore, 1-celled with 2 multiovulate placentas or 2-celled owing to the cohesion more or less of the placentas. Stigma sessile. Fruit globose or ovoid with a coriaceous rind. Seeds indefinite, reniform; testa coriaceous; radicle conical, incumbent. Trees or shrubs, leaves 3-foliolate, flowers corymbose, showy.

CRATÆVA RELIGIOSA. (Forst.; DC. Prod. I, 243.) A tree attaining about 30 feet. Branches glabrous, smooth or slightly verrucose. Leaves 3-foliolate. Leaflets membranous, acuminate, entire, glabrous, petiolulate, articulated to the petiole, 3-6 inches long; central leaflet elliptical elliptic-lanceolate or oblanceolate, narrowed into the petiolule; lateral leaflets usually obliquely ovate-elliptical or rhomboidal. Flowers polygamous, $\frac{3}{4}$-$1\frac{1}{2}$ inches across, in terminal and lateral many-flowered corymbs. Pedicels $\frac{1}{2}$-2 inches; upper bracts linear or subulate, caducous. Calyx-lobes oblong or ovate-oblong, distinct, rather acute. Petals enlarging after expansion; lamina elliptical or ovate, obtuse, claw equalling the sepals. Ovary ellipsoidal to globose, on a gynophore of 1-2 inches, 1-celled or 2-locular at least partially, owing to the cohesion of the placentas. Fruit about the size of an apple, with a coriaceous pericarp on a strong stipes. *Oliver Fl. Afr. p.* 99. C. Roxburghii, *B. Br.* C. Adansonii, et læta, *Dc. Prod. I.* 243.

A small tree very handsome when in flower, common throughout the Madras Presidency, Bombay, Bengal, and in Ceylon, and also found in Africa; it occasionally flowers before the leaves are developed, but not generally; it is very common on the banks of rivers, and is much planted by natives. The wood is soft but tolerably serviceable and is used for various purposes. The tree is called Uskia man (Telugu) in the Northern Division and in the Godavery forests, and Lunuwarana in Ceylon; the fruit is hard, globose and woody, and something like that of the Wood-apple (Feronia.)



Govindoo, delt.

Dumphy, Lith.

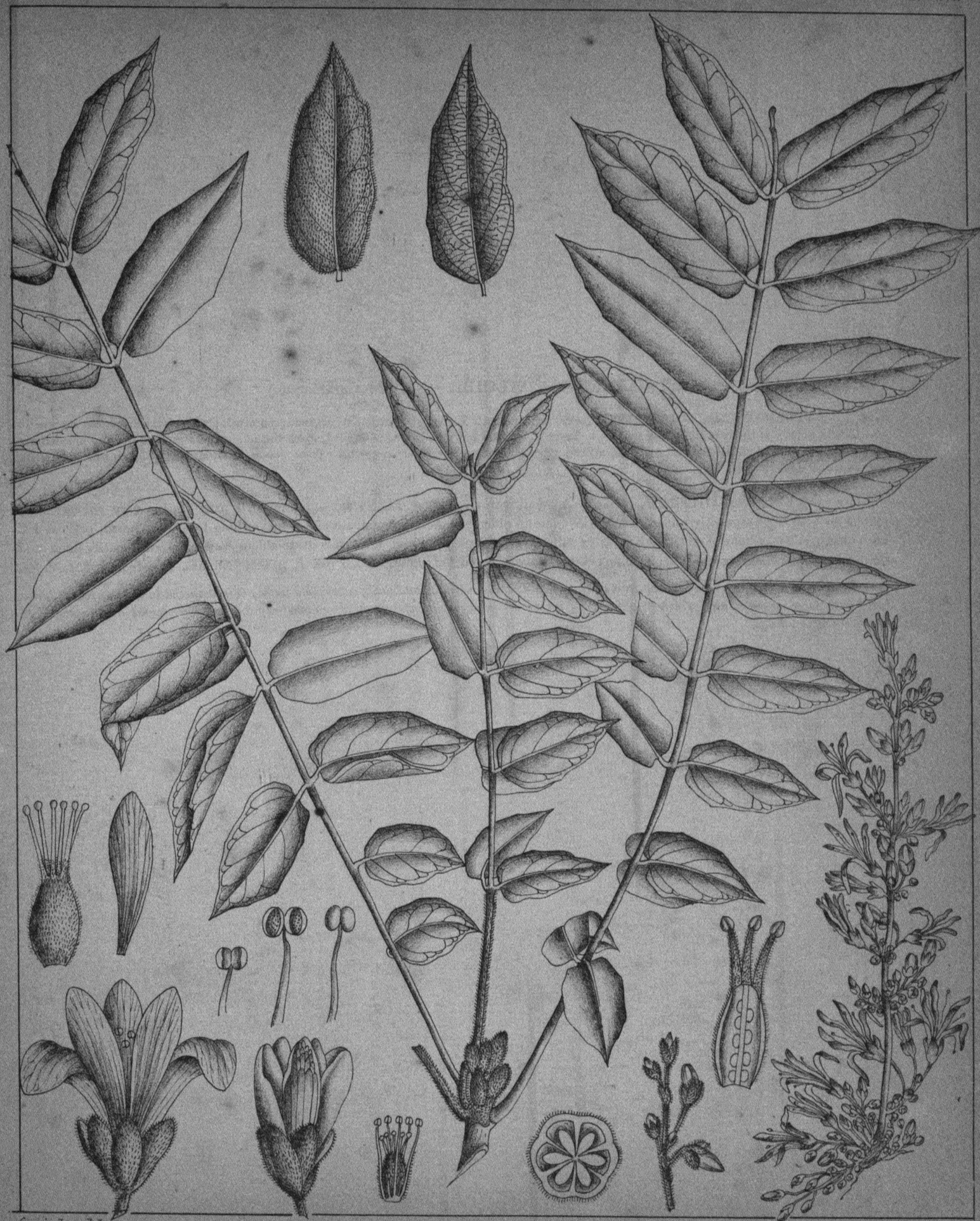
Cratæva religiosa (Forst)

AVERRHOA BILIMBI. (Nat. ord. Geraniaceæ.)

AVERRHOA. *Linn.*—GEN. CHAR. Flowers regular, sepals 5 imbricate, petals 5 hypogynous contorted, glands of the disk none, stamens 10 very shortly connate at the base all bearing anthers or 5 sterile, ovary slightly 5-6 lobed, 5-6 celled, styles distinct, stigmas capitate; ovules numerous in the cells, berry oblong indehiscent, seed naked or arillate, albumen fleshy sparse, embryo straight. Trees, leaves alternate unequally pinnate exstipulate, flowers racemosely panicled.

AVERRHOA BILIMBI. (Linn.) A small tree, 15-20 feet, leaflets sub-opposite 5-10 pairs (rachis very villous) softly villous on both sides especially underneath, entire ovate to oblong-lanceolate acuminate, $1\frac{1}{2}$-2 inches long by $\frac{3}{4}$ inch broad, petioles 1-2 lines long, panicles villous, flowers reddish, calyx villous or pubescent, limb of the petals ovate-oblong, anthers 10 alternately long and short, ovary 5-6 celled, style 5-6, fruit oblong obtusely angled, seed exarillate. *DC. Prod. I, p.* 689. Bilimbi, *Rheede Mal.* 3. *t.* 45, 46.

This pretty little tree is common in a cultivated and semi-wild state, and easily establishes itself; it is supposed to be a native of India, but I have never seen it in any of our jungles; the fruit is a pleasant acid, and syrup is made of it, and it is preserved and pickled. Its native name is bilimbi.



Govindoo, del. Dumphey, Lith.

Averrhoa Bilimbi (Linn.)

BENGAL SECRETARIAT
LIBRARY.

GARUGA PINNATA. (Nat. ord. Burseraceæ.)

GARUGA. *Roxb.*—GEN. CHAR. Flowers polygamous. Calyx campanulate, 5-lobed, valvate. Petals 5, inserted above the middle of the calyx-tube, induplicate-valvate. Disk thin, lining the calyx-tube. Stamens 10, inserted with the petals. Ovary 4 or 5-celled; styles elongated; ovules 2 in each cell. Drupe indehiscent, with 5 or fewer bony nuts, rugose outside. Seeds solitary in each nut; cotyledons folded. Trees, leaves pinnate. Flowers rather large for the order, in terminal panicles.

GARUGA PINNATA. (Roxb.) A large tree, leaves unequally pinnate, 8 inches to 3 feet long, leaflets very shortly petioled, generally about 7-9 pairs with an odd one, elliptic-oblong very unequal at the base with an acumination at the apex, crenate-serrate, 2-4 inches long by 1-1¼ broad, more or less villous on both sides or nearly glabrous, panicles terminal many flowered puberulous or mealy, flowers 2-3 lines in diameter yellowish white, disk lining the calyx tube for more than half its length and closely adhering to it, crowned with 10 gland-like rounded teeth at its apex each alternate with one of the stamens, filaments hairy, anthers versatile, ovary sessile hairy, styles hairy combined into one elongate about as long as the petals, stigmas 5, drupe globose fleshy about the size of a gooseberry with 1-5 bony nuts. *Roxb. Fl. Ind.* ii. 400.

A very common tree in almost every dry jungle and forest in the Madras Presidency, also in Bombay and Bengal, but absent from Ceylon; the leaves are deciduous in the cold weather and appear with the flowers early in the hot season; the fruit is eaten by the natives both raw and pickled. The tree is called Koorak in the Bombay Presidency, and Khar-pat in Bengal; the timber is I believe, inferior, but is in use with the natives, and rather prized in some parts. The bark is collected by tanners, and the leaves are used as fodder. The Teligu name is Garugu, and the Tamil Karre Vembu.

Govindoo del. Dunphy. Lith.

Garuga pinnata (Roxb.)

SCHLEICHERA TRIJUGA. (Nat. order Sapindaceæ.)

SCHLEICHERA. *Willd.*—GEN. CHAR. Flowers polygamo dioecious, calyx small 4-6 cleft valvate or obscurely imbricate, petals 0, disk repand or lobed, stamens 8-10 (rarely 4-5) inserted on to the disk, filaments elongate puberulous, anthers basifixed, ovary 3-4 celled, attenuated into a rigid style, stigma capitate 3-4 lobed, revolute, ovules solitary in the cells erect, fruit dry subcrustaceous ovoid apiculated with the base of the style unarmed or armed with a few prickles, 1-3 celled, seed erect included in a pulpy aril compressed, testa black, embryo conduplicate, cotyledons unequal connate. Trees, leaves alternate exstipulate abruptly or unequally pinnate, leaflets subopposite few paired entire or undulately repand, racemes simple or paniculate, flowers small fasciculate.—Cassumbium, *Rumph.* Koon, *Gært.* Melicocca, *Juss.*

SCHLEICHERA TRIJUGA. (Willd.) A large tree, young parts sericeous, leaves about the extremities of the branches abruptly pinnate, 8-16 inches long, leaflets 2 4 pairs, subopposite sessile lanceolate to oblong, entire very unequal at the base, pretty smooth on both sides, the lowest pair the smallest, 3 to 8 inches long by 1-1½ broad, panicles axillary or from the old axils, slightly puberulous; male flowers and hermathrodite generally on different trees, male flowers much crowded, stamens 6-10, generally 8, a small rudiment of an ovary in the middle of the disk. Hermathrodite, flowers more laxly arranged, ovary ovoid gradually attenuated into a short style 3 celled, cells 1 ovuled, ovules erect, stigma 3 lobed, fruit dry size of a small nut smooth and unarmed, or furnished with a few prickles, aril succulent and edible. *Roxb. Fl. Ind.* ii. 277.

This handsome tree is very abundant throughout the Madras Presidency, Bombay, Bengal and Ceylon, ascending the mountains up to about 3,000 feet, but always confined to the dry forests. It flowers early in the hot season, it is one of our most valuable unreserved timbers, and the wood is much prized in some districts; it is reddish in color, very hard and heavy, and makes excellent crushers for sugar and oil mills. and is in use for building and a variety of purposes. The common Tamil name is Puva, and the Teligu Puska, on the Anamallays it is called Puvatti by the Kaders, and in Canarese it is called Chakota and 'Akotà, in Ceylon Cong, and in Bengal Gosam. The fruit ripens in May, and the pulpy aril is a very agreeable acid; an oil is expressed from the seed and used for burning, and a quantity of lac is produced on the young branches. The fruit is sometimes quite smooth though often armed with prickles, which is evidently caused by some insect.

The figure represents a flowering branch of a male tree:—1 is a young male flower, stamens not fully developed; 2, the disk and stamens of male flower, calyx removed; 3, a branch of hermathrodite flowers; 4, an hermathrodite flower.

Govindoo del. Dempsey Lith.

Schleichera trijuga, (Willd.)

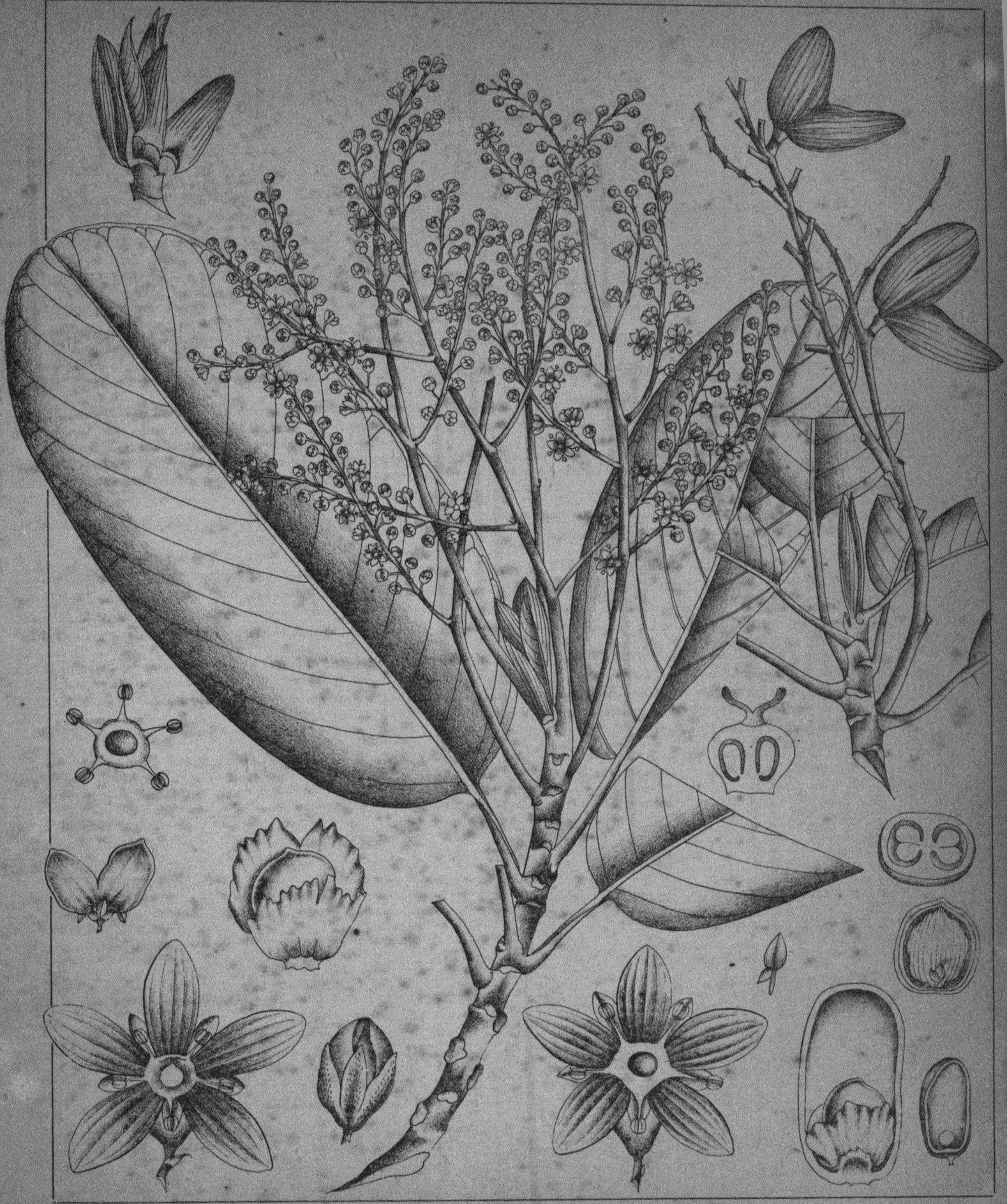
TROCHISANDRA INDICA. (Nat. order Celastrineæ.)

TROCHISANDRA. *Bedd.*—GEN. CHAR. Calyx 5 cleft, petals 5 patent, stamens 5 alternating with the petals and monadelphous in a complete ring round the base of the ovary, filaments subulate, anthers didymous, ovary globose free 2 celled, cells 2 ovuled, ovules erect, raphe ventral, micropyle inferior, styles 2 filiform, capsule coriaceous deeply 2 lobed 2 celled dehiscent, seed generally solitary by abortion erect furnished with a very large thick fleshy aril, albumen sparse fleshy, embryo erect, cotyledons small ovate unequal, radicle elongate. A lofty tree, stipules very large at the apex of the branches including the leaf bud, early deciduous and leaving a large scar, leaves alternate entire very coriaceous and shining penniveined, panicles axillary, flowers small on short pedicels.

My only flowering specimen of this new genus has been forwarded to Kew, and the generic character is taken from a drawing of the flower made some three years ago, and a specimen in fruit.

TROCHISANDRA INDICA. (Bedd.) A lofty tree, everywhere glabrous, leaves oblong to oblongo ovate very coriaceous and shining, veins very prominent on the underside scarcely acute or rounded at the apex 6-8 inches long by 2-3 broad, petioles 1-1¼ inches long, panicles axillary towards the apex of the branches about the length of the leaves many flowered, flowers small 2-3 lines in diameter, capsule deeply 2 lobed, lobes oblong 1-1½ inches long, one generally abortive and smaller than the fertile one, dehiscing at maturity.

A very handsome tree with a beautiful foliage, much resembling the Indian rubber tree (Ficus elastica) when only in foliage; it is very abundant in the dense moist forests of the Anamallays at an elevation of 3,000-4,500 feet, in which localities it is a very large tree, and I have also observed it on the banks of the Toracadu (on the same mountains) at an elevation of nearly 6,000 feet, but it is of smaller growth at this elevation; it is said by the natives to yield a valuable timber; it flowers in December and January, and ripens its fruit in April and May. The genus is nearly allied to Kurrimia (Wall).



Govindoo del. Dumphy, Lith.

Trochisandra Indica, (Beddi.)

ORDER XXI.—SIMARUBEÆ.

Gen. Char.: Flowers regular, diœcious or polygamous, more rarely hermaphrodite. Calyx usually small 3 to 5 lobed or divided into as many distinct sepals. Petals 3 to 5, hypogynous or slightly perigynous, imbricate or valvate in the bud, rarely wanting. Stamens either equal in number to the petals, and alternating with them, or double the number, anthers usually versatile, with 2 parallel cells opening longitudinally. Disk annular, cupular or elongated within the stamens under or round the ovary, or rarely none. Gynæcium of 3 to 5, rarely more or fewer carpels, quite distinct, or more or less united into a single lobed or rarely entire ovary, with one cell to each carpel. Styles as many as carpels, united from the base or by the stigmas only, or entirely distinct. Ovules solitary in each cell, or very rarely 2, the micropyle superior. Fruit-carpels either distinct, dry or drupaceous, usually indehiscent, or united in a single drupe or capsule. Seeds usually solitary in each carpel or cell, pendulous; testa membranous; albumen abundant, or little, or none. Embryo straight or curved; cotyledons flat or convex, rarely twisted; radicle superior. Shrubs or trees, with a bitter bark. Indumentum of simple not stellate hairs. Leaves alternate or rarely opposite, pinnate or simple, usually without glandular dots. Stipules none. Flowers usually small, in axillary or rarely terminal panicles or racemes.

Tribe I, SIMARUBEÆ.—Ovary deeply divided, the carpels or lobes entirely distinct or connected by the styles or stigmas.

Leaves pinnate	AILANTHUS.
Leaves simple	SAMADERA.

Tribe II, Picramnieæ.—Ovary entire or rarely shortly lobed, 2-5 celled.

Ovules solitary in the cells, sepals 5, stamens 10, ovary 5 celled ...	BALANITES.

AILANTHUS. DESH.

For Gen. Char. see letter press to plate of Ailanthus Malabarica, Pl. cxxii.

1. AILANTHUS MALABARICA, *DC.*—For description, &c. see Pl. cxxii.

2. AILANTHUS EXCELSA, *Roxb.*—A very large tree, leaves abruptly pinnate 1-2 feet long, young ones tomentose, adult glabrous, leaflets 10-14 pair ovate from a very unequal base, coarsely toothed with an inconspicuous gland beneath at the points of the teeth, 2-4 inches long by 1½-2 broad, flowers fascicled in large branched terminal racemes, yellowish about 3 lines in expansion, petals almost glabrous within, filaments glabrous shorter than the anthers, Samaræ linear oblong. *Roxb. Fl. Ind.* 2. 450;—*WA. Prod. p.* 150;—*Wight Illust. tab.* 67.

This large tree is very common throughout the Madras Presidency and in Bombay, but is absent from Ceylon; it is very extensively planted as it grows easily and rapidly from large cuttings, but it is a useless tree, it is bare of leaf for several months, and too brittle to stand much wind, the timber is soft, light, not durable and valueless for ordinary purposes, but catamarans, sword handles and spear sheaths are made of it, the tree is called Pedà màn in Teligu and Peru maram in Tamil.

SAMADERA. GÆRTN.

Gen. Char.: Flowers hermathrodite, calyx small 3 5 parted imbricate, glandulose at the base outside, petals as many as the sepals and alternate with them much imbricate coriaceous, much longer than the calyx, disk large obconical, stamens 6-10 included, furnished with a short hypogynous scale at the base, ovary 4-5 lobed free, styles united into 1, elongate, stigma acute, ovules solitary in the cells, pendulous. Drupes 1-5 (usually fewer than the ovaries from abortion) large, compressed, carinately winged, seed inverse, testa membranaceous, cotyledons plano-convex fleshy, radicle very small. Small glabrous trees, leaves alternate simple, peduncles axillary and terminal elongate, flowers few large.—Niota, *Lam.* Biporeia, *Thouars.* Vittmannia, *Vahl.* Samandura, *Linn.* Manungala, *Blanco.*

1. SAMADERA INDICA, *Gærtn.*—A small tree, leaves oblong elliptical coriaceous shining glabrous except the costa, quite entire, reticulately veined, generally furnished with 2 hollow glands at the base near the insertion of the petiole, and often with several similar ones dispersed over the leaf, 6-8 inches long by 2-3 broad, petioles ½-¾ inch long, peduncles larger than the leaves, axillary or terminal, compressed, pendulous, dilated at the apex and there crowded with the pedicels which are ½-¾ inch long. *Gært. Fruct.* 2. *p.* 352. Niota pentapetala, *Poir*;—*Encycl. Meth.* 4. *p.* 490;—*DC. Prod.* 1. 592. Vittmannia elliptica, *Vahl. Symb.* 3 *p.* 5, *t.* 62?—*Rheede Mal.* 6. *t.* 18.

A small tree not uncommon in the Malabar plains on banks of rivers and in Ceylon, where the native name is Samadara, the root and fruit are used medicinally.

Analysis of Genera, Pl. VIII. fig. 1.

1. A young bud showing the very imbricate petals and the glandular calyx.
2. A flower; petals removed showing the 8 stamens.
3. Anther showing the scale at the base of the filaments.
4. Disk, ovary and style.
5. Ovary cut horizontally.
6. A cell cut vertically.
7. Drupe cut horizontally.
8. A seed.

BALANITES. DELILE.

Gen. Char.: Flowers hermaphrodite. Sepals 5, with imbricate margins deciduous. Petals as many. Stamens 10; filaments unappendaged; anthers dorsally affixed. Ovary globose, pilose, 5 celled, inserted upon a thick fleshy disk; style simple, terminal. Ovules solitary. Fruit a drupe, 1 seeded, with a bony or crustaceous putamen. Seed exalbuminous; embryo with thick plano-convex, corrugate or 2 lobed cotyledons and a superior radicle. Shrubs or small trees, usually armed, at least when young or stunted, with axillary or supra axillary spines. Leaves 2 foliolate; leaflets entire, coriaceous. Flowers greenish, in axillary fascicles or short racemose cymes. *Oliver Fl. Tropical Africa, p.* 314.

1. BALANITES ÆGYPTIACA, *Delile*; *DC. Prod.* i. 708.—Extremities terete, minutely hoary-puberulous or glabrate; spines various, usually about ½-1 inch: sometimes 3 inches, often wanting on fully grown trees, straight, ascending or patent. Leaflets elliptical or varying from ovate to obovate-elliptical or rotundate, obtuse or broadly pointed ½ to 1½ inch long, shortly petiolulate; petiole usually much shorter than the leaflets. Ovary soon lengthening out after flowering, narrowed into the style. Drupe edible, with a thick bony putamen; the seed affording an oil. *Oliver. Fl. Trop. Africa, p.* 315. Ximenia Ægyptiaca, *Roxb. Fl. Ind.* ii. 253;—*Wight Ic. t.* 274.

A small tree, 20 feet high or sometimes only a shrub, common in the plains of the Dekkan, in the Central Provinces, the Northern Circars and Bengal. It is called Gari in Teligu and Hingol in Hindustanee, the wood is used for various purposes, but is always small; walking sticks are sometimes made from the tree; the exceedingly hard nut is used to make the firework called ànàr, it is bored, and the kernel extracted, and when filled with gunpowder will go off with a loud report, the leaves and bark are supposed by the natives to have medicinal properties.

Analysis of Genera, Pl. VIII. fig. 2.

1. A bud showing imbricate sepals.
2. A full flower.
3. A petal.
4. A full flower, petals removed.
5. Anthers.
6. Disk, ovary and style.
7. Ovary cut horizontally, showing the 5 cells.
8. The same cut vertically, showing the solitary pendulous ovules.
9. A fruit not full grown.

ORDER XXII.—OCHNACÆE.

TRIBE OCHNEÆ.

Gen. Char.: Flowers regular, hermaphrodite. Sepals 5, free, imbricate, scarious or coriaceous. Petals as many, free, equalling or exceeding the sepals, sub-sessile or unguiculate, contorted or imbricate. Stamens 10 or indefinite; filaments frequently persistent, free. Anthers linear, often elongate or oblong, basifixed, dehiscing longitudinally or by apical pores. Ovary deeply 3-10 lobed, inserted upon a thickened disk enlarging after flowering, each lobe 1 celled, 1 ovulate; style central, filiform or subulate; stigma terminal simple, or style divided at the apex into as many short branches as carpels; stigmas capitellate. Fruit of 3-10 drupes inserted upon the enlarged torus, sessile. Seeds exalbuminous; radicle very small. Trees or shrubs. Leaves alternate, simple, perfectly glabrous, penniveined, stipulate. Flowers in terminal or axillary panicles, racemes or fascicles; usually yellow or orange; pedicels articulated.

Of no importance as a Forest Order, the only two Indian genera being Ochna and Gomphia.

Stamens indefinite, anthers dehiscing by pore-like apical slits or longitudinally. ... OCHNA.
Stamens 10, anthers dehiscing by apical pores. ... ... GOMPHIA.

OCHNA. SCHREBER.

Gen. Char.: Sepals 5, coloured, imbricate, persistent. Petals 5-12, equalling or slightly exceeding the sepals, deciduous narrowed to the base or unguiculate. Stamens indefinite; filaments filiform; anthers linear or oblong, basifixed, dehiscing longitudinally or by pore-like slits. Ovary deeply 3-12 lobed; lobes 1 celled, 1 ovuled, inserted around a central disk. Styles connate, entire or shortly divided at the apex. Stigmas capitellate. Drupes 3-12 sessile. Trees or shrubs. Leaves alternate, usually serrulate, glabrous, with deciduous stipules. Flowers yellow, rarely greenish, with articulated pedicels.

1. OCHNA SQUARROSA, *Linn.*—A small tree, leaves from narrow-oblong to oblong-ovate or obovate obtuse or mucronate or acute or acuminate serrate, 6-7 inches long by about 2 inches broad, flowers yellow 1¼ to 1½ inches in expansion racemose from the apex of very short lateral almost or quite leafless shoots, pedicels elongated, sepals oval obtuse, petals and ovaries 5-12, stigma capitate 3 lobed anthers linear elongate. *Linn. Sp. p.* 781;—*Wight Ill. tab.* 69. Ochna obtusata, *DC. Prod.* 1. 735. Ochna lucida, *Linn.* Ochna cordata, *Thw. En. Pl. Zey. p.* 70.

This tree is very common in the Godavery forests, Kurnool and Cuddapah hills, and many other localities throughout the Presidency and in Ceylon. In Teligu it is called Sunari, and Narole in Canarese; it yields a pretty reddish timber.

Analysis of Genera, Pl. VIII, fig. 3.

1. A bud showing the imbricate sepals.
2. A full flower.
3. The same, petals removed, showing the position of the numerous stamens on the disk, and the lobed ovary and the style.
4. An anther.

5. Young fruit, showing the filaments still adhering to the disk, the anthers having fallen
6. Ovary cut vertically.
7. Young drupe cut vertically.
8. The same cut horizontally.

2. OCHNA WIGHTIANA, *Wall.*—A small tree or large shrub, leaves (on petioles 1 line long) ovate bluntish rounded at the base conspicuously veined very slightly serrate, 1-2 inches long by ½-¾ inch broad, pedicels 4-7 lines long articulated near the middle. solitary or in pairs from the apex of a very short leafless shoot, flowers 4 lines long yellow, sepals oval obtuse petals, and ovaries 5, styles deeply 5 parted at the apex. *WA. Prod.* 152. Ochna Heyneana, *WA. l. c.* Ochna Walkerii, *Planchon Hook. Lond. Journ. of Bot.* v. 653.

A not uncommon shrub or small tree, in many localities throughout the Presidency and in Ceylon.

3. OCHNA MOONII, *Thw.*; and 4. O. RUFESCENS, *Thw.*—Are shrubs or small trees inhabiting Ceylon; they are both nearly allied to each other and to squarrosa, but rufescens has very much smaller flowers.

GOMPHIA. SCHREB.

Gen. Char.: Character of Ochna, but stamens 10 only instead of indefinite, anthers elongate rugulose opening by terminal extrorse pores, lobes of the ovary usually 5. style simple. Trees or shrubs perfectly glabrous, leaves as in Ochna.—Ouratea, *Aubl.* Philomeda, *Noronha*. Walkera (in part), *DC.* 1. 737. Wolkensteinia, *Regal Garten. Fl.* xiv. 131. 471.

1. GOMPHIA ANGUSTIFOLIA, *Vahl.*—A tree, leaves elliptic-oblong, acuminate at both ends, sharply but slightly serrated shining, about 5-6 inches long by 1½ broad, racemes compound, sepals broadly oval shorter than the petals, carpels obovate-reniform. *Vahl. Symb.* 2. *p.* 49;—*WA. Prod. p.* 152. G. Zeylanica, *DC.* 1. 736. Ochna Malabarica, *DC. l. c.*

A tree, attaining 30 feet in height, common in the western forests of the Madras Presidency and in Ceylon, up to an elevation of 3,000 feet; called Botkæra by the Cinghalese. The wood is hard, and useful for building purposes.

Analysis of Genera, Pl. VIII, fig. 4.

1. A full flower, showing the 10 stamens.
2. The same, petals removed, showing position of the single row of 10 stamens.
3. Anthers.
4. Young fruit.
5. Ovary cut vertically.
6. Young drupe cut vertically.
7. The same cut horizontally.

ORDER XXIII.—BURSERACEÆ.

Gen. Char.: Flowers regular, hermaphrodite or polygamous. Calyx usually small, 3 to 5 rarely 7 lobed or divided into as many distinct sepals. Petals 3 to 5 rarely 7 hypogynous or perigynous, imbricate or valvate in the bud. Stamens twice as many as petals, or rarely of the same number, inserted on or around the disk; anthers versatile, with 2 parallel cells opening longitudinally. Disk usually annular or cupular, often adnate to the base of the calyx. Ovary free, 2 to 5 celled, tapering into a single style, with an entire or lobed stigma. Ovules 2 in each cell or rarely solitary, usually pendulous, the micropyle superior. Fruit a drupe, either indehiscent or the epicarp opening in 2 valves, pyrenes 2 to 5, bony or chartaceous, distinct or united. Seeds solitary in each pyrene, pendulous; testa membranous; albumen none. Cotyledons usually membranous, folded or rarely thick and fleshy. Shrubs or trees, often yielding a balsamic fluid. Leaves usually alternate, pinnate, or 3 foliolate, without or rarely with stipules. Flowers small, in racemes or panicles.

* Epicarp valvate, pyrenes adnate to a central axis.
Calyx 5-7 toothed, petals 5-7 drupe trigonal or 4 gonal. ... ... BOSWELLIA.
** Drupe indehiscent, or 2-5 valved, pyrenes closely cohering.
† Stamens 6-10.
A thin disk lining the calyx tube. .. .. GARUGA.
Disk very small with 8 gland like crenatures, flowers subsessile. ... ... BALSAMODENDRON.
Disk thick, fleshy, half as long as the calyx tube and lining it at its base, free above, 4 lobed, flowers long peduncled. ... . PROTIUM.
Disk annular very thick and fleshy, stamens inserted below the disk or round its margin; or disk none, stamen-tube submembranaceous as long or longer than the calyx ... ... CANARIUM.
† † Stamens 5.
Calyx 5 parted, petals 5, stamens on a villous disk. ... ... FILICIUM.

An order of considerable importance, containing some resin-bearing fragrant trees, though no particularly valuable timber; the black dammer is a gigantic tree very abundant in all the moist western forests of the Madras and Bombay Presidencies up to 4,000 feet, it is the Canarium strictum of Roxburgh, but no botanist appears ever to have seen the flowers, and I have only procured the male, though I have specimens from several different localities, the structure of the flower differs so much from typical Canarium, that I was much inclined to propose a new genus for this plant. The disk is absent, and the stamens are placed on a long submembranaceous tube, pending the discovery of the female flower it is perhaps better that it should remain in the genus, so I have slightly revised the generic character to receive it, and if the female should only differ from the male in the presence of a fertile ovary, it may I think still remain in the genus thus revised; if a new genus is constituted I would propose the name Kungilium after its native name, which is universally known in the localities where it grows. In Ceylon there are two other species of Canarium, large trees, (Canarium Zeylanicum and C. brunneum), and the Canarium commune, a Java tree, has been introduced into India and Ceylon, and is a rapid growing ornamental tree. Boswellia gives two resin bearing trees, the Boswellia glabra, very abundant in all our dry subalpine forests throughout the Presidency, and the B. thurifera, which is more scarce, and which I have only seen on the eastern side of the Presi-

dency and in Bengal; Garuga has one species, a large tree with bunches of grape-like-fruit, common in all our dry forests. Balsamodendron, 1 small middling sized fragrant resin bearing tree, rare in the jungles but abundantly in use as a hedge plant throughout the Presidency. Protium (a genus not sufficiently distinct from Balsamodendron) yields 2 middling sized fragrant trees, the P. caudatum, very common both wild and in a planted state, and the P. pubescens, a rare species. Filicium decipiens, a highly ornamental fern-leaved tree with a useful timber is not uncommon in our moist western jungles, it has been introduced into gardens in Calcutta, Madras and Ceylon, and appears to succeed well in the plains, it grows most readily from seed, and its extended cultivation in our parks and gardens is highly desirable as a more ornamental tree does not exist in India.

BOSWELLIA. Roxb.

For Gen. Char. see letter press to plate of B. glabra, Pl. cxxiv.

1. Boswellia glabra, *Roxb.*—For description, &c., see Pl. cxxiv.

2. Boswellia thurifera, *Coleb.*—A middling sized tree, leaves alternate towards the apex of the branches, unequally pinnate about 16 inches long, leaflets about 14 pair opposite or subopposite pubescent when young (as is the common petiole) at length subglabrous except the costa and veins, sessile or subsessile, narrow lanceolate attenuated into a blunt point at the apex always prominently serrated, 2-2¼ inches long by 6-7 lines broad, racemes terminal and from the upper axils rather crowded shorter than the leaves, rather densely villous as are the calyx and corol; flowers whitish. *Coleb in As. Res.* 9. 377 :—*Roxb. Fl. Ind.* ii. 383.

This tree is not uncommon on the mountains in the northern division of this Presidency and in parts of Bengal, but my specimens are not as good as I could wish, it differs from B. glabra in being much more hairy, and in the leaflets being narrower and more serrated; it yields an olibanum or gum resin which is highly fragrant, and burns with a clear light diffusing an agreeable fragrance, it is often burnt in Roman Catholic Churches and is used medicinally by the natives; it is called Luban and Sàlai in Bengal, the timber is used by the natives for various purposes. It flowers early in the hot season.

GARUGA. Roxb.

For Gen. Char. see letter press to Plate No. cviii.

1. Garuga pinnata, *Roxb.*—For description, &c. see Pl. cviii.

BALSAMODENDRON. Kunth.

For Gen. Char. see letter press to Plate cxxvi.

1. Balsamodendron Berryi, *Arnt.*—For description, &c. see Pl. cxxvi.

PROTIUM. WA.

For Gen. Char. see letter press to Pl. cxxv.

1. Protium caudatum, *WA.*—For description, &c. see Pl. cxxv.

2. Protium pubescens, *WA.*—A middling sized tree, much resembling P. caudatum, young branches pubescent, leaflets 2-3 pair with an odd one, sessile or subsessile, ovate shortly acuminate, pubescent on both sides, as is the petiole, about 1¾ inches long by nearly 1 inch broad, panicles and calyx pubescent otherwise the same as in P. caudatum. *WA. Prod. p.* 176.

I have only seen this tree on the slopes of the Annamally hills, it may be a pubescent state of P. caudatum, but (as far as I can make out from my only specimen) the leaves are quite different.

CANARIUM. Linn.

For Gen. Char. see letter press to Pl. cxxvii.

1. Canarium brunneum, *Thw.*—For description, &c. see Plate cxxvii.

2. Canarium Zeylanicum, *Bl.*—A large tree, stipules large oblique rotundate sagittate, soon deciduous, leaflets 5-9 ovate or elliptic acuminate subrotund at the base, entire glabrous, 3-5¾ inches long by 1½-2½ broad, panicles terminal divaricated, flowers 2-3 together almost sessile at the extremity of the ultimate pedicels, before expanding enclosed in their ovate concave silky bracteoles; calyx externally silky. *Bl. Mus. Bot.* 1. 218. Canarium commune, *WA. Prod.* 175. (not *Linn*). Balsamodendron Zeylanicum, *Kunth.*;—*DC. Prod.* ii. 76. Amyris Zeylanica, *Retz.*

This tree is common in the warm moist districts of Ceylon up to 1,500 feet elevation, and is called Kaa-Koona; the resinous balsam which exudes from the trunk is used by the Cinghalese for burning after being mixed with paddy chaff.

3. Canarium strictum, *Roxb.*—For description, &c. see letter press to Pl. cxxviii.

4. Canarium commune, (the Java almond) has been introduced into gardens in Ceylon and the Madras Presidency.

FILICIUM. Thw.

For Gen. Char. see letter press to Pl. cxxix.

1. Filicium decipiens, *Thw.*—For description, &c. see Pl. cxxix.

Under the name of Icica Wight and Arnot describe in their Peninsula Flora a species of *Bursera*, the *Bursera serrata*, *Wall*, this is a tree found in Northern India, but it does not occur in the Peninsula.

ORDER XXIV.—MELIACEÆ.

Gen. Char. : Flowers regular, usually hermaphrodite. Calyx small 3-4-5 (rarely 7) lobed, or divided into as many distinct sepals. Petals 5-4 or 5, rarely 7, free or adnate to the staminal tube, imbricate or rarely valvate. Stamens as many or more frequently twice as many, as petals ; the filaments except in *Cedreleæ* united in a tube ; anthers sessile or shortly stipitate within, or at the summit of the tube ; in *Cedreleæ* filaments free. Disk various, often annular or tubular, free within the staminal tube. Ovary free, entire, 3 to 5 celled ; style simple ; stigma thick disk-shaped or pyramidal. Ovules in each cell 2, or (in *Carapa*, *Swietenieæ* and the *Cedreleæ*) 4 or more, the micropyle superior. Fruit a capsule, berry, or rarely a drupe, indehiscent, or septicidally or loculicidally dehiscent. Seeds 1 rarely 2, or in *Swietenieæ* and *Cedreleæ* few in each cell, with a ventral hilum ; albumen fleshy or none, embryo flat or nearly so, radicle superior. Trees or shrubs, the wood often coloured and sometimes fragrant, the bark rarely bitter. Leaves alternate or very rarely opposite, simple or more frequently pinnate, the petiole often continuing long to grow out and produce fresh leaflets ; leaflets without dots. Flowers paniculate, often small.

A most important order for the Indian Forester ; it yields the (Satin wood) Chloroxylon Swietenia ; (the Chittagong wood) Chickrassia tabularis ; (the Toon or Bastard Chittagong wood) Cedrela Toona ; (the Red cedar) Soymida febrifuga ; and 3 species of Melia (generally known as Nim trees) all of which are large trees yielding valuable timber ; of less valuable trees it contributes 1 species of Mallea, 2 of Dysoxylon, 1 of Sandoricum, 1 of Aglaia, 4 of Amoora, 1 of Lansium, 3 of Walsura, 1 of Heynea, 2 of Beddomea and 1 of Carapa ; little is known of the timbers of these latter. Swietenia, the Mahogony, is an introduced tree. Turæa, Nuregamia, Munronia (all in the Tribe Melieæ) are S. Indian genera only producing small plants.

Tribe I, Melieæ.—Stamens united into a tube, ovules 2 in each cell, seeds not winged albuminous.

Ovules superposed, drupe with a 1-5 celled bony putamen	Melia.
Ovules collateral drupe with 5 cartilaginous pyrenes	Mallea.

Tribe II, Trichilieæ.—Stamens united into a tube, ovules 2 or rarely 1 or (in Carapa) more than 2 in each cell, seeds not winged, without albumen.

* Disk tubular.	
Petals valvate, capsule loculicidal	Dysoxylon.
Petals imbricate, fruit indehiscent...	Sandoricum.
* * Disk annular or undistinguishable from the thickened base of the ovary.	
† Anthers included or nearly included in the stamen tube.	
Stamens equal in number to or not twice as many as the petals	Aglaia.
Stamens twice as many as the petals, berry indehiscent	Lansium.
Stamens twice as many as the petals, capsule loculicidally 3-5 valved	Amoora.
† † Anthers exserted.	
α Fruit 1 seeded.	
Berry indehiscent, 1 celled 1 seeded...	Walsura.
Capsule 1 celled dehiscing in 2 valves 1 seeded	Heynea.
β. Fruit several seeded.	
Anthers 5	Beddomea.
Anthers 8-10	Carapa.

Tribe Swietenieæ—Stamens united into a tube, cells of the ovary many ovuled, capsule 3-5 valved, seeds numerous albuminous or exalbuminous, winged.

Petals 5, stamen tube urceolate 10 toothed, disk annular, seed with a long broad wing above albuminous ...	Swietenia.
Petals 5, stamen tube cupular with 10 two toothed lobes, disk broad, seed winged on both sides exalbuminous.	Soymida.
Petals 4 5, stamen tube cylindrical 10 crenated, disk none, seed winged downwards exalbuminous ...	Chickrassia.

Tribe Cedreleæ.—Stamens free inserted on the outside of the disk, ovary cells many ovuled.

Petals erect, stamens 4-6 ovary 5 celled, capsule septifragal	Cedrela.
Petals patent, stamens 10, ovary 3 celled, capsule loculicidal	Chloroxylon.

MELIA. Linn.

For Gen. Char. see letter press to Pl. xii.

1. Melia composita, *Willd.*—For description, &c. see Pl. xii.

2. Melia Azadirachta, *L.*—For description, &c. see p. 13, Pl. xiii. (printed Pl. xiv. by mistake.)

3. Melia Azedarach, *L.*—For description, &c. see p. 14, Pl. xiv. (printed Pl. xiii.)

MALLEA. A. Juss.

Gen. Char.: Calyx short cupular 5 toothed, petals 5 short patent induplicately valvate, stamen tube entire at the base and connate with the disk deeply 10 cleft upwards, each division sharply bifid and bearing an anther on the inside between the apiculations, anthers 10, erect slightly apiculate, disk cupular; ovary 5 celled, cells 2 ovuled, ovules collateral from above the middle of the axis, style short clavate, stigma hemispherical 5 lobed, drupe 5 lobed with a slightly fleshy epicarp containing 5 bony indehiscent 1-2 seeded pyrenes. Seed reniform angled, pendulous from the middle of the cell, hilum small, testa membranaceous, albumen fleshy, embryo curved; cotyledons oblong, radicle oblong. A small tree, leaves alternate imparipinnate, leaflets opposite entire or deeply serrate, panicles axillary, flowers small.—Cipadessa, *Bl. Bijdr.* 162. Heynichia, *Kunth ?* Ekebergia, *Roxb.* (not *Sparrm.*)

1. Mallea Rothii, *Ad. de Juss.*—A small tree, young parts sericeous, leaves alternate unequally pinnate 6-10 inches long, common petiole puberulous; leaflets 4-6 opposite pair, elliptic oblong from an unequal base the terminal leaflet the largest, grossly serrate on the upper half or towards the apex, slightly hairy on the veins otherwise glabrous, 1-3 inches long by ½-1¼ broad, petiolules about 3 lines long, panicles axillary long peduncled, flowers small whitish inodorous, drupe the size of a small pea, red when ripe and somewhat succulent. *Ad. de Juss in Mem. Mus.* 19. *t.* 13. Ekebergia Indica, *Roxb. Fl. Ind.* ii. 392.

A small tree common throughout the Madras and Bombay Presidencies and in Ceylon; it is only used for fuel. It is called Chend berà and Purndona in Teligu, and Nàl bilà in Hindoostani.

Analysis of Genera, Pl. VIII, fig. 5.

1. A bud, showing the valvate petals.
2. A flower, petals removed, showing the staminal tube.
3. Staminal tube, showing the 10 stamens.
4. Front and back view of a single lobe of the same, showing the slightly apiculate exserted anther seated between the sharp bifid clefts.
5. A flower, petals and staminal tube removed, showing the ovary, disk and style.
6. Ovary cut horizontally.
7. The same cut vertically.
8. A young fruit or drupe.
9. The same forced open, showing the five 1-celled pyrenes.
10. One of the pyrenes removed from within the epicarp.

DYSOXYLON. Bl.

Gen. Char.: Calyx small, 4 or 5-toothed, or divided into 4 or 5 sepals. Petals 4 or 5, free or adnate to the staminal tube spreading at the top. Staminal tube truncate or 8 or 10 toothed; anthers 8 or 10, within the summit. Disk tubular as long as or usually much longer than the ovary. Ovary 3 to 5-celled; style elongated; stigma disklike; ovules 2 in each cell, or rarely solitary. Capsule globular or pear shaped, 1 to 5 celled, opening loculicidally in 2 to 5 thickly coriaceous valves. Seeds with or rarely without an arillus, oblong, with a broad ventral hilum; testa coriaceous; albumen none; cotyledons large. Trees, often fœtid. Leaves pinnate, leaflets opposite or alternate in the same species, entire, often oblique. Panicles axillary, loose, but often small. Flowers not very small. *Bl. Bijdr.* 172;—*Benth. Fl. Aust. p.* 380. Hartighsea, *A. Juss.* Didymocheton, *Bl. l. c.* 177. Goniocheton, *Bl. l. c.* 177. Gaurea, *Roxb.* (not *Linn.*)

1. Dysoxylum macrocarpum, *Bl.*—A large tree, leaflets 4 6 pairs entire glabrous, 5-8 inches long 1½-3 inches broad, petiolules 4 lines long, panicles supra-axillary 3-5 inches long minutely hoary-tomentose, few flowered, pedicels articulated, flowers pale green about 3 lines long, stamens 8, calyx cupuliform slightly 4 emarginate, petals reflexed acute externally minutely tomentose, staminal tube 4 angled, teeth 8 obtuse bifid, disk as long as the rounded pilose ovary, denticulate, fruit reddish, round, about 2½ inches in diameter shortly pedicelled, 4 celled, 4 seeded, seeds polished dark purple. *Bl. Bijdr. p.* 175;—*Thw. En. Pl. Zey. p.* 60. Amoora ficiformis, *Wight. Ill.* 1. 147. Gaurea binectarifera, *Roxb. Cat.* see Pl. cl.

Wynad, Tinnevelly, and western parts of the Madras Presidency in the moist forests of the mountains, also in Ceylon.

2. Dysoxylum, *sp.*—There is an immense undescribed tree of this genus, common in the Anamallay forests, Coorg, &c., at 2-3,000 feet elevation, I hope to figure it shortly, but my specimens are too imperfect at present. It is called Porapà by the Kaders on the Anamallays, and it flowers in January and February. The fruit is quite round, the size of a billiard ball, very hard and roughly tubercled, of a bright yellow when ripe, dehiscent 3-4 seeded, the seeds bluntly 3 sided, attached by their whole inner face to the central placenta, testa reddish brown, cotyledons green.

SANDORICUM. Cav.

Gen. Char.: Calyx cupular; tube adnate to the base of the ovary, limb shortly 5 lobed imbricate, petals 5 free oblong obtuse imbricate, staminal tube cylindric 10 toothed at the apex, anthers 10 included, disk tubulose 5-toothed sheathing the ovary and base of the style, ovary immersed in the base of the calyx, 5 celled, attenuated into a columnar style, style clavate above girt with a thickened ring, stigmas 5 thick erect, apices recurved, ovules 2 in the cells collateral, pendulous from near the apex of the axis, berry superior globose fleshy indehiscent 3-5 celled, cells 1 seeded partitions disappearing at maturity, seeds arillate, arillus parchment-like pulpy on the outside, testa brown polished and spongy, cotyledons very thick collateral, radicle superior. Trees, leaves trifoliate, panicles axillary, fruit acid edible.

1. SANDORICUM INDICUM, *Cav.*—A small or middling sized tree, bark green smooth, leaves alternate trifoliate about 12 inches long, leaflets ovate entire glabrous above except when young, downy beneath, 5-7 inches long, 3-4 broad, petioles round downy, stipules none, panicles axillary diffuse shorter than the leaves, bracts oblong, flowers numerous small yellow, calyx downy, the staminal tube about 4 times as long as the disk, anthers sessile linear, berry nearly round size of a small orange slightly villous when ripe, yellow, pulp copious fleshy acid and edible. *Cav. diss.* 7. *t.* 202, 203 ;—*Roxb. Fl. Ind.* ii. 392. Trichilia nervosa, *DC.* 1. *p.* 623. Melia Koetjape, *Burm.*

Mysore, and elsewhere in the Madras Presidency, introduced from the Moluccas. This tree will shortly be figured.

AGLAIA. LOUR.

Gen. Char.: Flowers polygamous. Calyx 4 or 5 toothed or cleft. Petals 4 or 5, short, connivent, imbricate in the bud. Staminal tube globular or urceolate, entire or shortly toothed ; anthers as many as petals or rarely more, within the summit of the tube. Disk none, or not distinct from the base of the ovary. Ovary 2 or 3 celled, with a short thick style and disk-like stigma ; ovules 1 or 2 in each cell. Fruit coriaceous or almost succulent indehiscent. Seeds 1 or 2, enveloped in a mealy pulp, without any arillus (or arillus sometimes present ?). Trees, either glabrous or clothed with small scurfy scales or rarely with stellate tomentum. Leaves pinnate, with entire leaflets. Flowers very small, nearly globular, in axillary panicles. *Benth. Fl. Aust. p.* 382. Milnea, *Roxb.* Nemedra, *Juss.*

1. AGLAIA ROXBURGHIANA, *WA.*—For description, &c., see Pl. cxxx.

The fruit varies in shape, and I cannot distinguish A. apiocarpa, *Thw.*, which I have from Ceylon. I have, I believe, 2 new species, unless this species is a very variable one, a small tree from the foot of the Tinnevelly ghats (Chokampatty) has the leaves only 2-4 inch long, trifoliate or never more than 2 pair of leaflets with an odd one, fruit pear-shaped ; the other, a small shrub from the South Canara plains, leaflets very broadly oval or obovate, flower very small ; all the species of the genus are polygamous, and it is not always easy to procure good specimens and fruit, which are necessary for a careful discrimination of the different species or varieties ; judging from flowers only, all may well be varieties of one species.

AMOORA, ROXB.

Gen. Char.: Flowers polygamous. Calyx 3 to 5 toothed or lobed. Petals 3 to 5, imbricate in the bud, free from the staminal tube. Staminal tube urceolate or nearly globular, truncate or crenate ; anthers within the tube, twice as many as petals or rarely only 7 when there are 4 petals. Disk none, besides the thickened base of the ovary. Ovary 3 to 5-celled or rarely 2-celled, with 1 or 2 superposed ovules in each cell ; style short or long with a disk like stigma. Capsule obovoid or globular, coriaceous or hard, opening loculicidally in 3 to 5 valves (or sometimes indehiscent ?). Seeds solitary in each cell, enclosed in a fleshy arillus (or sometimes without an arillus ?) Trees, leaves pinnate, with entire leaflets. Flowers small but usually larger than in Aglaia. *Benth. Fl. Aust.* 1 *p.* 383. Andersonia, *Roxb.* Nimmoia, *Wight.* Oraoma, *Turcz. in Bull. Mosc.* 1858, 1. 411. Monosoma, *Griff. Not.* iv. 502.

1. AMOORA ROHITUKA, *Roxb.*—For description, &c., see Pl. cxxxii.

2. AMOORA LAWII, *Wight.*—For description, &c., see Pl. cxxxiii.

3. AMOORA CUCULLATA, *Roxb.*—A tree of considerable size, glabrous, bark ash coloured smooth, leaves alternate unequally pinnate, 6-18 inches long, leaflets opposite 2-4 pair, short petioled, obliquely ovate-lanceolate, obtuse unequally divided by the costa, coriaceous entire and smooth on both sides, 3-6 inches long terminal, leaflets often cowled at the base, male and female flowers on separate trees, the male in solitary axillary many flowered drooping panicles, flowers small yellow trimerous, bractes a small obscure scale under each division of the panicle, and 2 pressing the calyx laterally, stamens 6-8 sessile, rudiment of ovary clavate small : the female in axillary 3-6 flowered solitary racemes, stamens 6, ovary 3 sided covered with minute scurfy scales, 3 celled with 2 superposed ovules in each cell attached to the axis, stigma large sessile 3 lobed, lobes somewhat 2 lobed; capsule nearly round of a tough fleshy texture as large as a middling sized apple 3 valved, seed solitary slightly trigonal, ⅔th covered with a bright orange aril, testa chesnut coloured.—Andersonia cucullata, *Roxb. Fl. Ind.* ii. 213.

This tree is found sparingly throughout the Presidency and in Bengal.

4. AMOORA CHAMPIONII, *Thw.*—A large tree, leaves glabrous abruptly pinnate, leaflets 2-3 pair oblongo-spathulate subcoriaceous, veinless, rounded at the apex, 2-4 inches long by ¾-1½ broad, panicles supra-axillary 2-3 inches long, minutely pilose, flowers octandrous yellowish, about 3 lines long, calyx shortly 4 lobed, petals glabrous acute, staminal tube 8 toothed, teeth bifid obtuse ; fruit pyriform, 1 inch long, cells 1-2 seeded. Dysoxylon Championii, *H. f. et T. MSS.* ;—*Thw. En. Pl. Zey. p.* 61. Amoora, *l. c. p.* 409.

A large tree in the central provinces of Ceylon, up to 4,000 feet.

LANSIUM. RUMPH.

For Gen. Char. see letter press to plate of L. Anamallayanum, Pl. cxxxi.

1. LANSIUM ANAMALLAYANUM, *Bedd.*—For description, &c., see Pl. cxxxi.

WALSURA. Roxb.

Gen. Char.: Calyx short 5 cleft imbricate, petals 5 free oblong patent imbricate or subvalvate, staminal tube deeply 8-10 cleft, divisions linear subulate or 2 cleft at the apex, or filaments 8-10 free, anthers 8-10 terminal erect exerted, disk annular fleshy, ovary depressed 2-3 celled immersed in the disk attenuated into a short style, stigma turbinate 2-3 toothed, cells 2 ovuled, ovules collateral, from the middle or above the middle of the axis, pendulous, berry fleshy indehiscent, 1 celled, 1 seeded, seed inverse covered by a fleshy aril, radicle superior. Trees, leaves 1-3 foliate or pinnate, leaflets alternate, panicles axillary or terminal many flowered, flowers small. Benth. and Hook. subdivide the genus into 2, viz. *Euwalsura*, petals imbricate, filaments connate 2 toothed at the apex. *Surwala*, petals subvalvate, filaments free; the S. Indian species belong to the former.

1. Walsura piscidia, *Roxb.*—A small tree, bark ash colored in old trees deeply cracked, leaves alternate petioled trifoliate, or pinnate, leaflets alternate oblong entire frequently emarginate, above smooth shining green, below whitish, 2-3 inches long by 1 broad, stipules none, flowers numerous small of a yellowish white color, in small terminal panicles, bracts minute caducous, petals imbricate, filaments connate into a tube nearly all 2 toothed at the apex but 1-2 generally rounded and entire, berry oblong downy pulpy, 1 celled, 1 seeded, indehiscent.—*Roxb. Fl. Ind.* ii. 388.

A small tree not uncommon in various parts of the Madras Presidency, called Walsura in Tamil and Walursi in Teligu, the wood is considered good by the natives and used for various purposes, the bark is used to intoxicate fish and does not render them unwholesome.

Analysis of Genera, Pl. VIII., fig. 6.

W. Piscidia.

1. A flower showing the imbricate petals.
2. The same petals removed and showing the stamen tube.
3. A stamen tube opened showing the inner face.
4. Two filaments removed from a stamen tube showing that 1 has a bifid apex and the other an entire rounded apex (in each stamen tube 1 or 2 only of the latter are generally found.)
5. A flower, petals and stamen tube removed, showing the large disk in which the ovary is sunk, the style and large stigma, the latter slightly bifid at the apex.
6. The same cut vertically showing the attachment of the ovules.
7. The ovary cut horizontally showing the 2 cells and 2 collateral ovules in each cell.

2. Walsura ternata.—A small tree, bark smooth rust coloured, leaves alternate trifoliate, leaflets narrow lanceolate entire, above smooth, beneath whitish, 4-5 inches long by 1 inch broad, petioles 2 inches long rust coloured, stipules 0, panicles axillary bracts single small caducous, flowers very numerous small white, calyx and corol as in W. piscidia, divisions of the stamen tube alternately rounded and bidentate, disk salver-shaped with a large high callous margin, stigma large, apex 2 lobed, berry narrow oblong downy indehiscent 1 seeded. *Roxb. Fl. Ind.* ii. 389.

I have only seen this tree in the Godavery forests and in the hilly districts of the northern division of the Madras Presidency, and my specimens are only in fruit, it is called Chinnà Wallursi in Teligu.

3. Walsura Gardneri, *Thw.*—A small tree about 12 feet high, leaves unifoliate glabrous, leaflet entire ovate obtusely acuminate 3-6 inch long by 1½-2½ broad, petiolule 1-3 lines long articulated with the much longer petiole, fruit oblong slightly apiculate at the apex 6-8 lines long, flowers the same as in W. piscidia. *Thw. En. Zey. p.* 61.

Ceylon, in the central provinces 2,000 to 4,000 feet elevation (perhaps only a 1-foliate variety of No. 1.)

HEYNEA. Roxb.

For Gen. Char. see letter press to plate of H. affinis, Pl. cxxxiv.

1. Heynea affinis, *Wl.*—For description, &c. see Pl. cxxxiv.

BEDDOMEA. Hook. fil.

For Gen. Char. see letter press to Pl. cxxxv.

1. Beddomea simplicifolia, *Bedd.*—For description, &c. see Plate cxxxv.

2. Beddomea Indica, *Hook. fil.*—A large shrub or very small tree, erect or straggling, young parts scaly pubescent, leaves trifoliate or pinnate 5-12 inches long by 6-9 inches broad, leaflets 1-2 pair with an odd one, below slightly lepidote or glabrous, entire sub-coriaceous elliptical obtusely pointed, 4-7 inches long by 2½ broad, petioles of the lateral leaflets ¼ to ½ an inch long, of the terminal one, 1 inch long, racemes axillary or a little above the axils simple or paniculate furnished as is the calyx with rust coloured close pressed scales, few or many flowered, 3-6 inches long, flowers about 3 lines in diameter on pedicels 1-3 lines long furnished with a small bract at the base of each pedicel, petals glabrous equal in size or 2 interior smaller, stamen-tube very short slightly crenate at the margin, anthers sessile at the apex of the tube almost wholly exerted very large thick 3-angled with a thickened connective, fruit ovate to oblong, 1-1½ inches long more or less furrowed, rough with close set rusty scales, dehiscent, seeds several. *Hook. fil. Gen. Pl.* 1. *p.* 336. name only.—*Bedd. in Linn. Trans. Vol.* xxv.

Common throughout the Western ghats of the Madras Presidency from Coorg down to Cape Comorin, up to 3,500-4,000 feet elevation.

CARAPA. AUBL.

For Gen. Char. see letter press to Pl. cxxxvi.

1. CARAPA MOLUCCENSIS, *Lam.*—For description, &c. see Pl. cxxxvi.

SWIETENIA. LINN.

Gen. Char. : Calyx small 5 cleft imbricate, petals 5 patent contorted, staminal tube urceolate, 10 toothed, anthers 10 fixed in the teeth of the tube apiculate disk annular ovary sessile ovoid 5 celled, stigma discoidal 5 radiate ; ovules many in the cells, pendulous from the axis, capsule 5 celled, septicidally 5 valved from the base, seeds numerous imbricate in 2 series, winged. A tree, leaves abruptly pinnate glabrous, leaflets opposite petiolulate obliquely ovate with a long acumination, panicles axillary and subterminal, flowers small.

1. SWIETENIA MAHOGONI, *Linn.*—This is the true mahogoni tree, a native of central America (the only species of the genus) it is mentioned here as it has been introduced into several places in this Presidency and in Bengal, and grows admirably, and its extended cultivation is receiving attention.

SOYMIDA. A. JUSS.

For Gen. Char. see letter press to Pl. viii.

1. SOYMIDA FEBRIFUGA, *Juss.*—For description, &c. see Pl. viii.

CHICKRASSIA. A. JUSS.

For Gen. Char. see letter press to Pl. ix.

1. CHICKRASSIA TABULARIS, *Juss*—For description, &c. see Pl. xi.

CEDRELA. LINN.

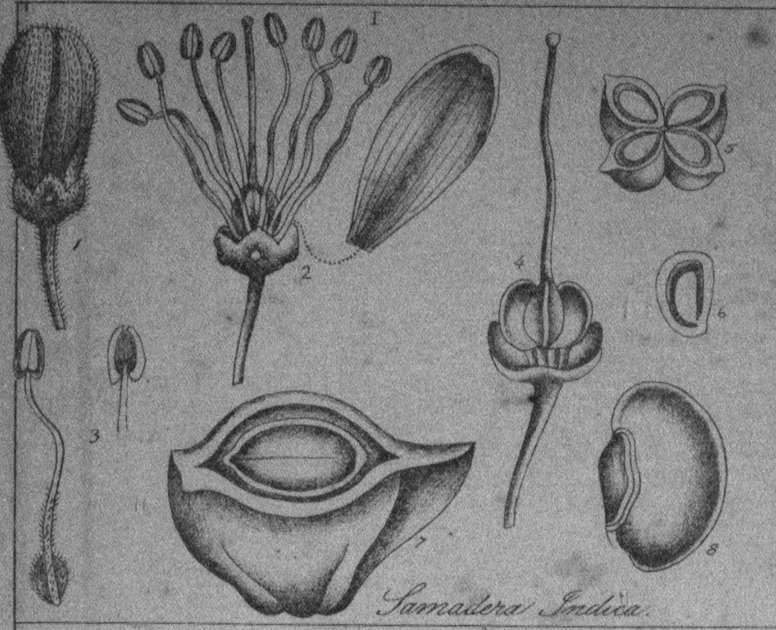
For Gen. Char. see letter press to Pl. x.

1. CEDRELA TOONA, *Roxb.*—For description, &c. see Plate x.

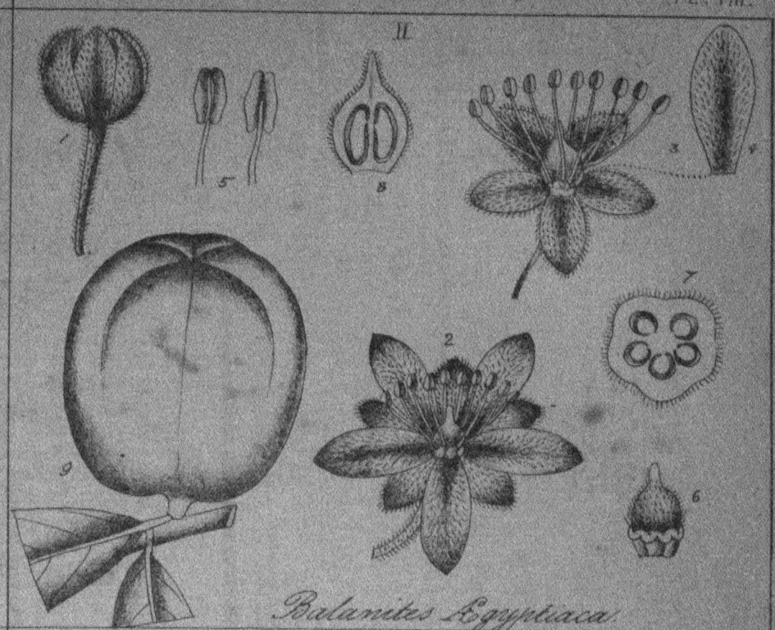
CHLOROXYLON. DC.

For Gen. Char. see letter press to Pl. xi.

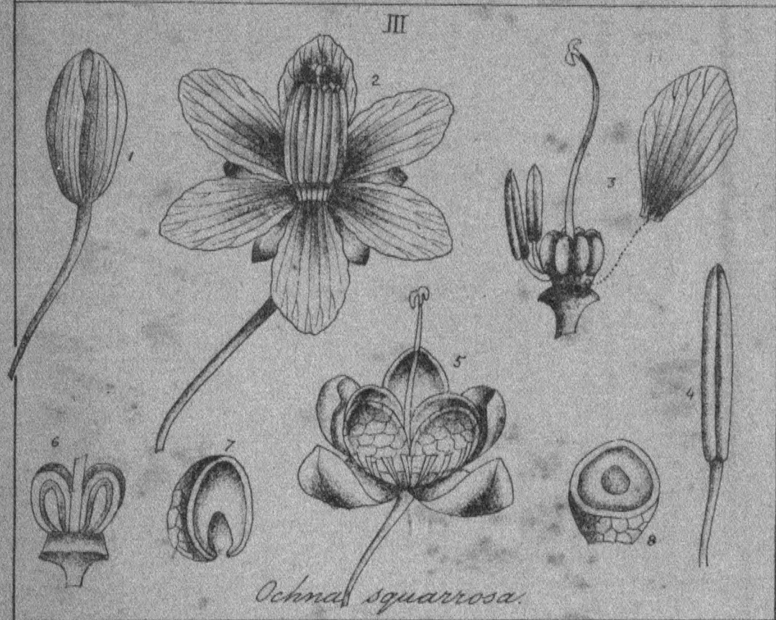
1. CHLOROXYLON SWIETENIA, *DC.*—For description, &c. see Pl. xi.



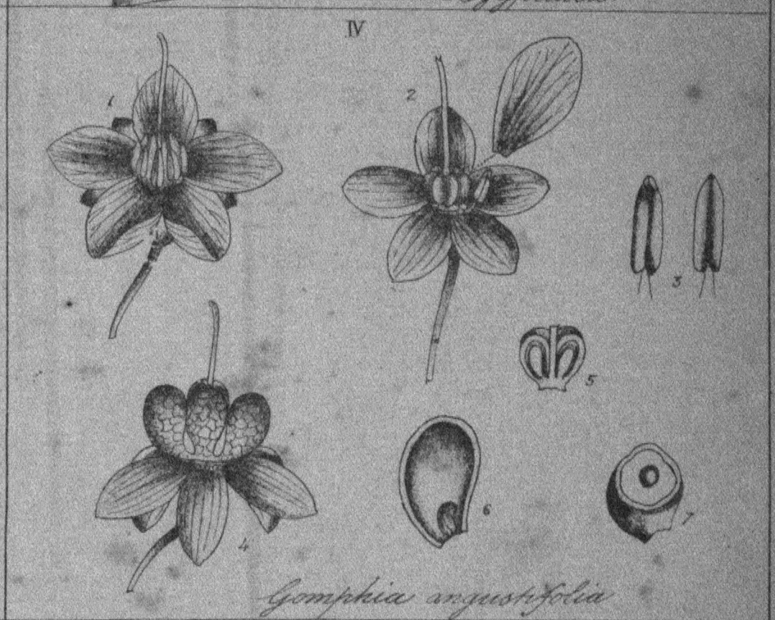
Samadera Indica.



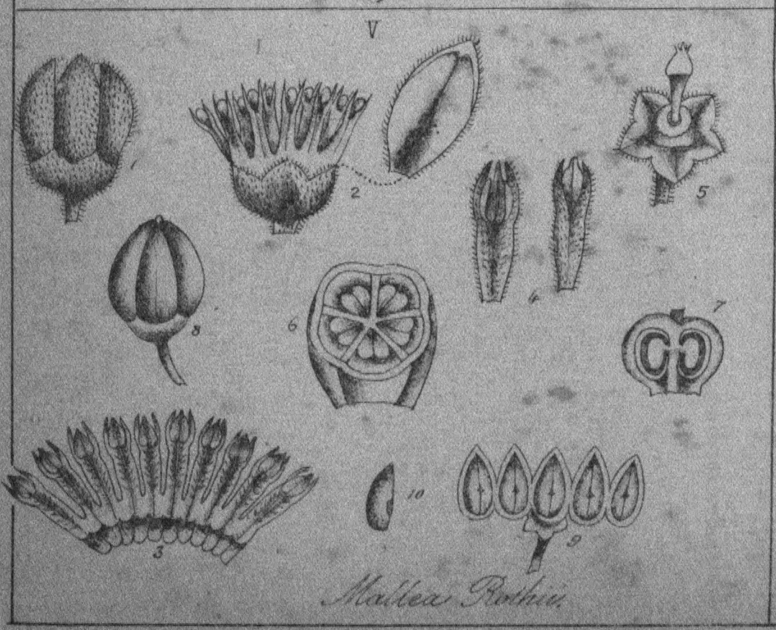
Balanites Egyptiaca.



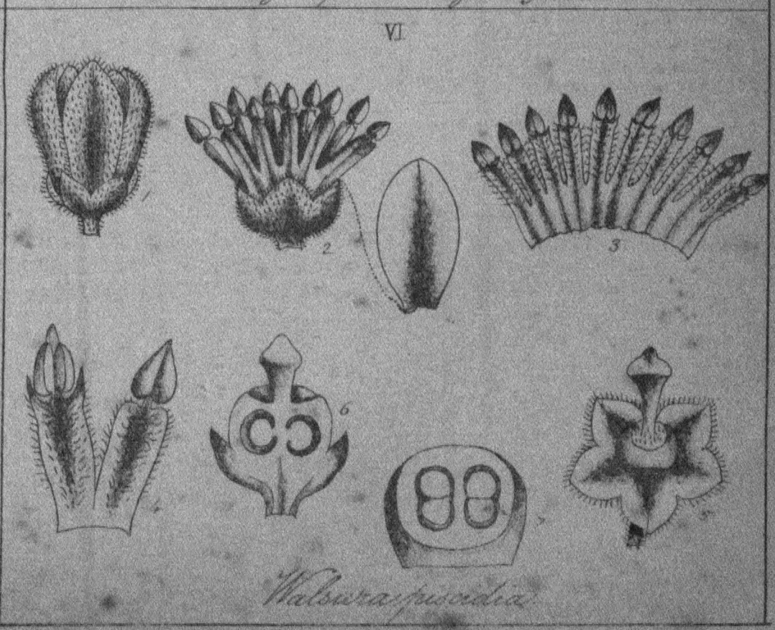
Ochna squarrosa.



Gomphia angustifolia.

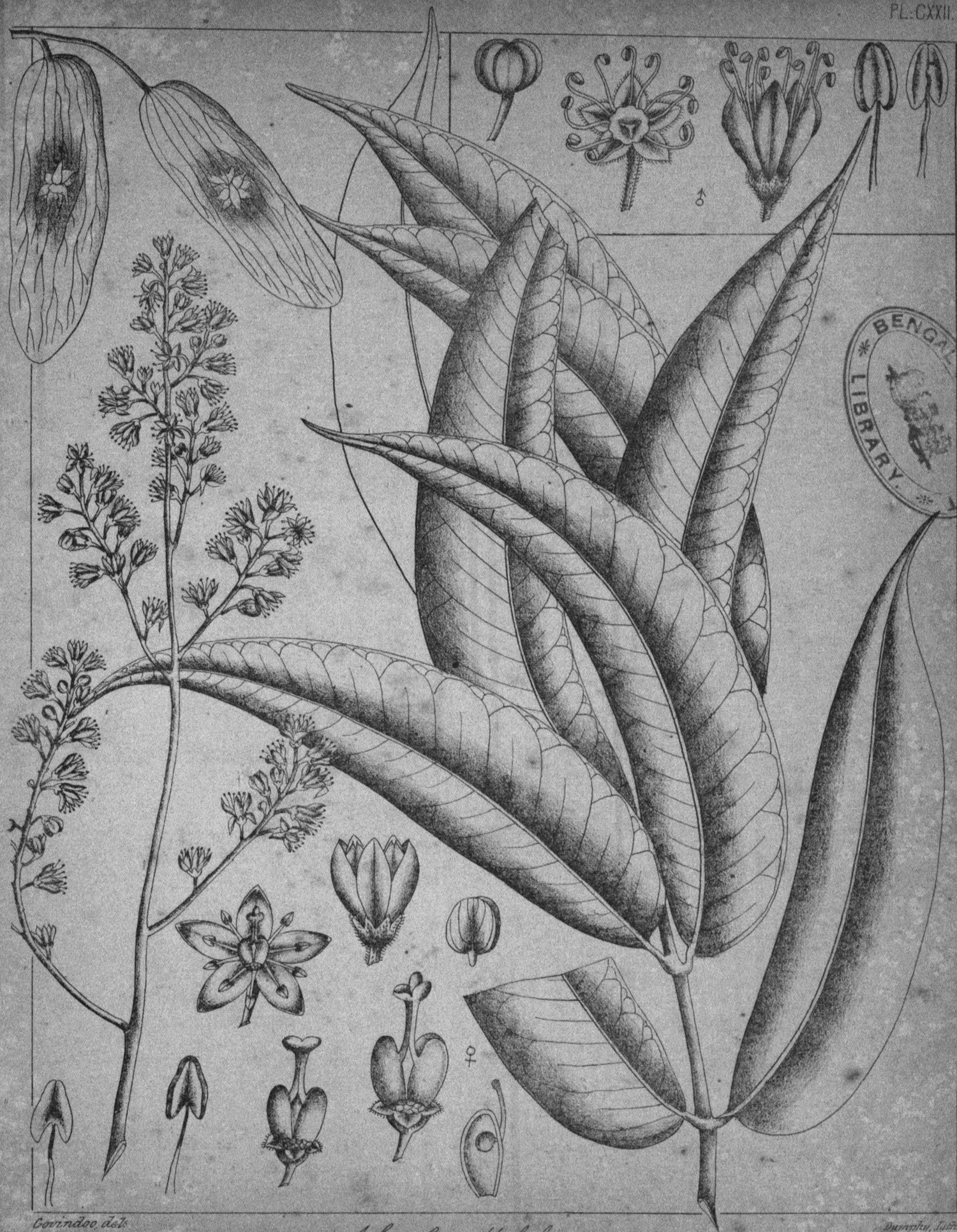


Malvea Rothii.



Walbura piscidia.

Govindoo del. Dicksonsky Lith.



BENGAL GEOLOGICAL LIBRARY

Coomdoo, del. Dunphy, Lith.

Ailanthus Malabarica / D.C.

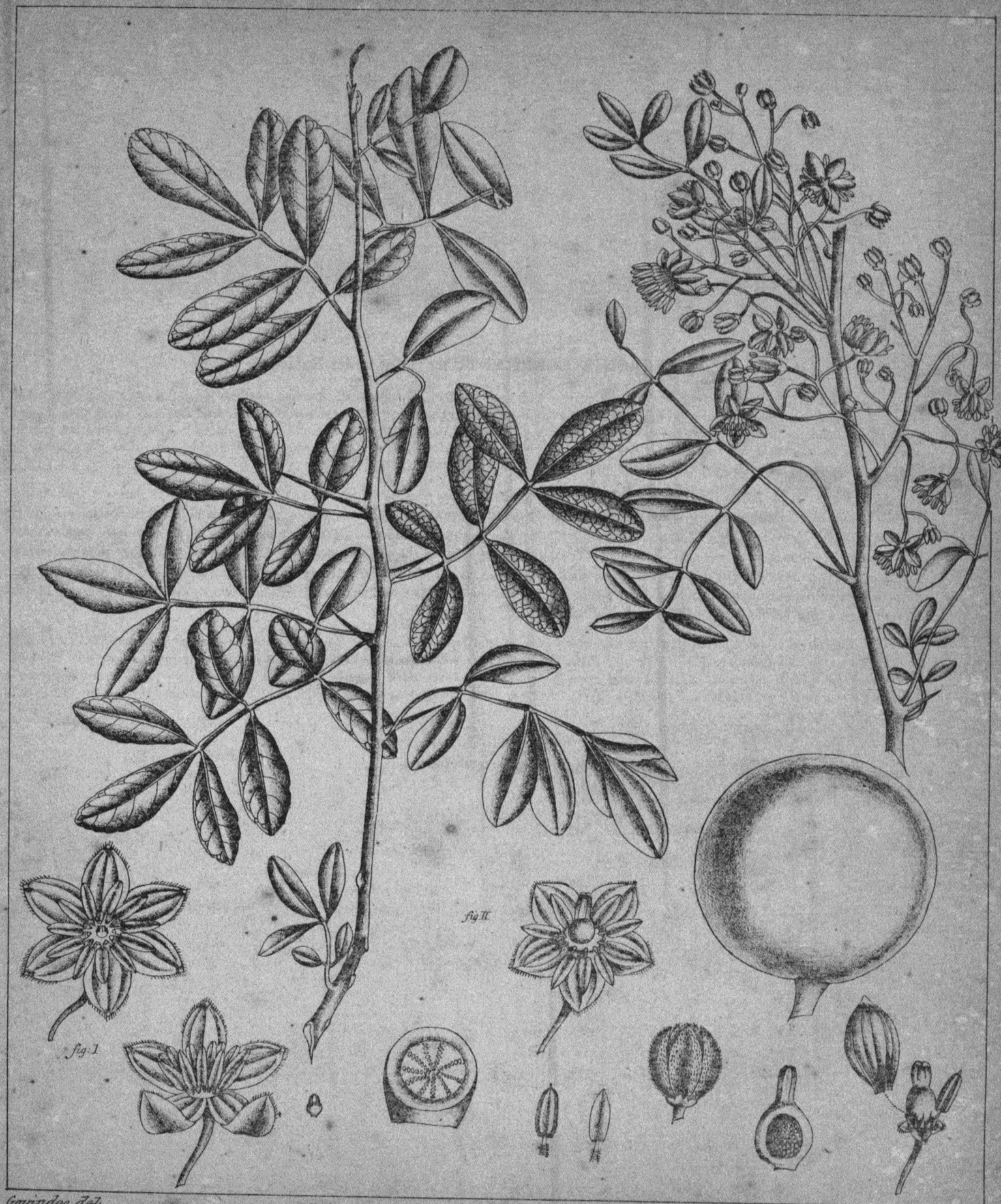
FERONIA ELEPHANTUM. (Nat. order Rutaceæ.)

FERONIA. *Correa.*—GEN. CHAR. Flowers polygamous by abortion, calyx small 5 toothed, teeth deciduous, petals 5 rarely 4-6 patent oblongo-lanceolate imbricate with incurved tips, stamens 10-12 (sometimes a few imperfect ?) filaments dilated at the base, apiculate at the apex, inserted below the torus, anthers linear-oblong, torus a short soft woolly bed, style none, stigma large oblong 5 lobed, ovary oblong 1 celled, placentas 5-6 parietal, ovules numerous crowded in many series, berry globose woody 1 celled, many seeded, filled with pulp, seed oblong compressed, cotyledons thick fleshy. A thorny tree, leaves unequally pinnate, flowers racemose or panicled ; fruit large woody, pulp edible.

FERONIA ELEPHANTUM. (Corr.) A large tree, leaves unequally pinnate 2-4 inches long quite glabrous, leaflets 5-7 almost sessile lanceolate to obovate quite entire or slightly crenulate towards the apex, furnished with glandular dots, petioles slightly winged, panicles short axillary or terminal or from nodes in the old axils, puberulous, flowers small dull reddish colored, petals ciliate at the apex, in the male flower there is a small abortive ovary and 5 lobed stigma and generally 11-12 fertile stamens, in the hermathrodite the stamens are fertile generally 10, the filaments in the male are rather shorter and less apiculate than in the hermathrodite, (I have never observed imperfect stamens in either sex.) Fruit as large as a billiard ball, hard and woody with a greyish rind, seeds immersed in fleshy edible pulp. *DC. Prod. Vol.* i. 538.

This tree is common throughout India and in Ceylon, it is universally known as the Wood-apple, in Teligu it is called Velagà and Elakà ; Kaweet in Hindustanee ; Velà in Tamil ; Bilwàr in Canarese ; and Diwool in Ceylon : the wood is hard, strong, heavy and durable, and is used for various purposes. A gum exudes from the trunk, which is much like the gum Arabic, the pulp of the fruit makes a pleasant jelly, and the leaves are used medicinally by the natives. The tree flowers in February and March, it is much cultivated throughout India, it is the only species of this genus.

Fig. i. fertile flowers.
Fig. ii. male flowers.



Govindoo. del.

Dunphy. Lith:

Feronia elephantum. (Corr:)

AILANTHUS MALABARICA. (Nat. order Simarubeæ.)

AILANTHUS. *Desf.*—GEN. CHAR. Flowers polygamous, calyx small 5 lobed, lobes equal imbricate, petals 5 patent valvate or slightly imbricate at the sides with the tips incurved, disk 10 lobed, stamens 10 in the male flowers, (10 or fewer or none in the female or hermathrodite) inserted at the base of the disk, filaments very short or filiform without scales, ovary of 2-5 carpels more or less connate (rudimentary in the male flowers) carpels compressed 1 celled, styles as many as the carpels consolidated into 1 with plumose stigmas, often more or less distinct towards the base, ovules solitary in each cell attached to the ventral suture below the apex, fruit of 1 to 5 oblong membranous samarœ thickened in the centre round the single seed, seed flattened, suspended, testa membranaceous, albumen scanty, cotyledons leafy nearly orbicular, radicle short superior. Large trees, leaves alternate pinnate, leaflets many pair, flowers small in terminal panicles.

AILANTHUS MALABARICA. (DC.) A lofty tree, bark rough and often studded with bright reddish grains of resin, leaves equally pinnate, quite glabrous 15-20 inches long, leaflets 6-10 subopposite or opposite pair commencing a little above the base of the petiole, semiovate from a very unequal base gradually attenuated into a long acumination, glabrous on both sides, shining above, very pale beneath, (veins pinnate forked and looped near the margin) 3-7 inches long by 1-1½ broad, petiolules 2-4 lines long; panicles axillary much branched nearly as long as the leaves and occasionally leafy at the base of the lowest ramification, slightly puberulous or glabrous, calyx slightly puberulous and ciliate, petals slightly imbricate at the edges and with incurved tips, male flowers smaller than the female, disk 10 lobed with a minute 3 lobed rudiment of an ovary in its centre, stamens much exserted, much longer than the corol, anthers oblong attached by the centre of the back; female flowers with 10 sterile stamens alternately shorter, all much shorter than the corol, anthers sterile saggitate basifixed, disk large irregularly lobed or warted. Samara 3-3¾ inches long by 10-13 lines broad. *DC. Prod.* ii. *p.* 89. Pongelion, *Rheed. Mal.* 6. *t.* 25.

A very lofty tree, common in the dense moist forests of the Western ghats of the Madras Presidency (up to 3,000 feet) from S. Canara down to Cape Comorin, also in Ceylon; in S. Canara it is called Doop or Baga Doop, matti pàl on the Annamallays, and Kumbalu or Wal biling in Ceylon, in Travancore the tree is commonly planted, and is very ornamental, a fragrant resinous balsam (known as mutti pàl) exudes from the trunk, reduced to powder mixed with milk and strained it is given by native doctors in dysentery and said to be a first rate remedy, the bark has a pleasant slightly bitter taste and is used medicinally by the natives as a febrifuge and tonic. Mr. Broughton has favored me with the following report on some of the resin submitted to him for analysis.

"This resin as commonly met with is dark brown or grey in color, is plastic, opaque and has an agreeable smell. It contains much impurity. The pure resin is very soft, having the consistence of thick treacle, and this is doubtless the reason why it is always mixed with fragments of earth which makes it more easy to handle. The sample which I examined contained but 77 per cent. of resin, the remainder being adulterations. Alcohol readily dissolves the resin, and on evaporation leaves it as a very viscous, transparent light brown semi-liquid which does not solidify by many days exposure to a steam heat. When burnt it gives out a fragrance, and hence it is sometimes used for incense. Its perfume is however inferior to that produced by many other resins employed in the concoction of the incense employed in Christian and Heathen worship. The peculiar consistency of the resin would enable it to substitute Venice turpentine for many purposes. A substitute for Venice turpentine in India is mentioned as a desideratum in the reports of the Juries of the Madras Exhibition of 1855, *class IV."*

ODINA WODIER. (Nat. ord. Anacardiaceæ.)

ODINA. *Roxb.*--GEN. CHAR. Flowers polygamous. Calyx 4-5 fid or partite; segments ovate or roundish. Petals as many, imbricate. Disk small, annular or saucer-shaped. Male flowers, stamens 8 or 10, inserted under the margin of the disk; anthers versatile or subversatile. Rudiment of ovary usually 4 fid. Fertile flowers, anthers smaller often effete. Ovary sessile, free, glabrous or hairy, 1 celled. Styles 4 or 3, short, distinct, rather stout; stigmas terminal. Ovule solitary, pendulous. Drupe oblong or ellipsoidal, compressed. Embryo with flat fleshy cotyledons. Trees or shrubs. Leaves alternate, deciduous, unequally pinnate, usually collected at the extremities or in lateral tufts from nodes of a previous year; leaflets opposite, entire. Flowers racemose, often fasciculate, shortly pedicellate or subsessile. *Roxb. Fl. Ind.* ii. 293. Lannea, *Guill. and Perr. Fl. Seneg.* 1. 153.

ODINA WODIER. (Roxb.) A large tree, trunk of no great height to the branches, but thick and tolerably straight, bark pretty smooth ash colored, branches numerous, the lower spreading the upper ones disposed in every direction generally leafless at the time of flowering, leaves alternate about the ends of the branchlets unequally pinnate 10 to 18 inches long, leaflets about 5 opposite pair (with an odd one) on the upper half of the common petiole; sessile or subsessile ovate to oblong often oblique at the base entire with a longish blunt acumination, when young more or less covered with white stellate wool at length quite glabrous, 2-5 inches long by 1 2 inches broad; inflorescence terminal the male on long filiform panicled spikes, the fertile on short racemes both covered with stellate rather scaly pubescence, flowers tetramerous very small, male and fertile on the same tree or on different trees, calyx slightly hairy, in the male there are 8 fertile stamens on long filaments inserted under the 8-9 lobed disk, in the centre of which is the rudiment of an ovary terminating in a style with a star-like 4 cleft apex, in the female there are 8 sterile anthers on short filaments a large ovary crowned with 4 short stout distinct styles, stigmas more or less 2 cleft, drupe kidney-form smooth, red when ripe, the size of a small olive.

This tree is common in most of our jungles aad is found in Bengal, Bombay and Ceylon, and is also abundant everywhere in this Presidency in a planted state, particularly as an avenue tree, but the cultivated trees are generally grown from cuttings and are gnarled ugly specimens; it is the worst possible avenue tree as it is bare of leaves for several months in the driest and hottest time of the year; it is called Gumpini and Dumpini in Teligu, Wodier and Wude in Tamil, Shimtee and Poonil in Canarese, and Hig or Hok in Ceylon, it seldom ascends the mountains to any elevation, but is found all over the Mysore plateau at 3,000 *feet; the outer wood is white and worthless, but the heart wood of good seedling trees which is of a deep reddish mahogany, is useful for many purposes and would be excellent for cabinet purposes and furniture, the tree is lopped for fodder and a gum exudes from the trunk which is used medicinally by the natives, being given in asthma and as a cordial and used as a plaster and also in cloth printing, the tree inhabits Birmah, where it is called Nabhay and the timber is in use for sheaths of swords, spear handles, oil presses and rice pounders, and a closely allied species is found in tropical Africa.*

Garnidoo. del.

Dumphy. lith.

Odina Wodier. (Roxb.)

BOSWELLIA GLABRA. (Nat. order Burseraceæ.)

BOSWELLIA. *Roxb.*—GEN. CHAR. Flowers reuglar hermathrodite. Calyx small 5-7 toothed persistent, petals 5-7 spreading imbricate, stamens 10-13 alternately shorter inserted under the fleshy annular undulate or crenate disk, ovary sessile narrowed into a short style 3 rarely 4 celled, stigma 3-4 lobed or entire, ovules 2 in each cell collateral attached to the axis above the middle, fruit 3 rarely 4 angled coriaceous, the epicarp separating in 3-4 valves from as many bony 1 seeded pyrenes which are persistent to the central axis, seed compressed pendulous with a membranaceous margin, testa membranaceous, cotyledons multifid contortuplicate or quite flat, radicle superior. Trees abounding with resin, bark deciduous in papery or membranous laminæ, leaves deciduous crowded at the apex of the branches, alternate, unequally pinnate, exstipulate, leaflets opposite serrate, racemes or panicles axillary or collected at the ends of the branches, appearing before the leaves, flowers white. *Roxb. Pl. Corom.* iii. 4. *t.* 207. Libanus, *Coleb. in As. Res.* 9. 377 *t.* 5. *f.* 1. Plæsslia, *End. Nov. Stirp. Dec.* 39.

BOSWELLIA GLABRA. (Roxb.) A good sized tree with a greenish smooth bark, leaves alternate towards the apex of the branches unequally pinnate, about 1 foot long, the petiole very slightly puberulous or glabrous, leaflets 6-10 opposite or subopposite pair, with a terminal odd one, sessile or subsessile, glabrous on both sides, from quite entire to distantly serrated often only towards the apex, lanceolate obtuse about 2½ inches long, by 10-12 lines broad, racemes terminal, or from the upper axils rather crowded, slightly puberulous, calyx puberulous or subglabrous 5-6 or occasionally 7 cleft, petals 5-6 occasionally 7 slightly puberulous on the back, anthers hairy 10-12 occasionally 13, ovules 2 in each cell collateral attached to the axis above the middle, stigma 4 lobed, pyrenes (not quite mature) heart-shaped with a long beak at the apex (at length winged ?), cotyledons flat or contortuplicate trifid, lobes again variously cut or entire, radicle superior long. *Roxb. Fl. Ind.* ii. *p.* 384.

This fragrant resin-bearing tree is very common in many of our dry subalpine jungles, particularly on the eastern side of the Presidency, on the Vellore, Cuddapah, North Arcot and Kurnool hills, Mysore, Guzzlehatty pass, &c. &c.; it does not occur in Ceylon, it flowers in January and February generally when quite destitute of leaves, the gum-resin is the olibanum of commerce and is known to the natives as Koondricum, it is much used as a fragrant incense and (when boiled with oil) as pitch, and is also said to possess stimulant astringent and diaphoretic properties, it is largely used in some parts of India as an application to indolent sores and is supposed to form the chief ingredient in "Wroughton's ointment," it is well deserving of careful attention and can be procured in almost any quantity, the substance is bitter and pungent and is soluble in æther and spirits of wine; in Tamil the tree is called Kungli and Googoolu and Telugu Anduga. I am not acquainted with its timber, but it is said by the natives to be of little or no value.

Analysis.

The drawing is from fresh specimens collected on the Nilgiri slopes, the analysis is from 5 merous flowers (which are most common) but the sepals and petals are sometimes 6-7 and the stamens 12-13.

Fig. i. is a fruit opened, showing the heart-shaped pyrene or nut.

Fig. ii. A nut cut vertically, showing the embryo with unfolded trifid cotyledons (they are sometimes folded.)

Fig. iii. An embryo opened out showing more cut cotyledons than in fig. ii.

Carvalho, del. Dampitz, Lith.

Boswellia glabra (Roxb.)

PROTIUM CAUDATUM. (Nat. ord. Burseraceæ.)

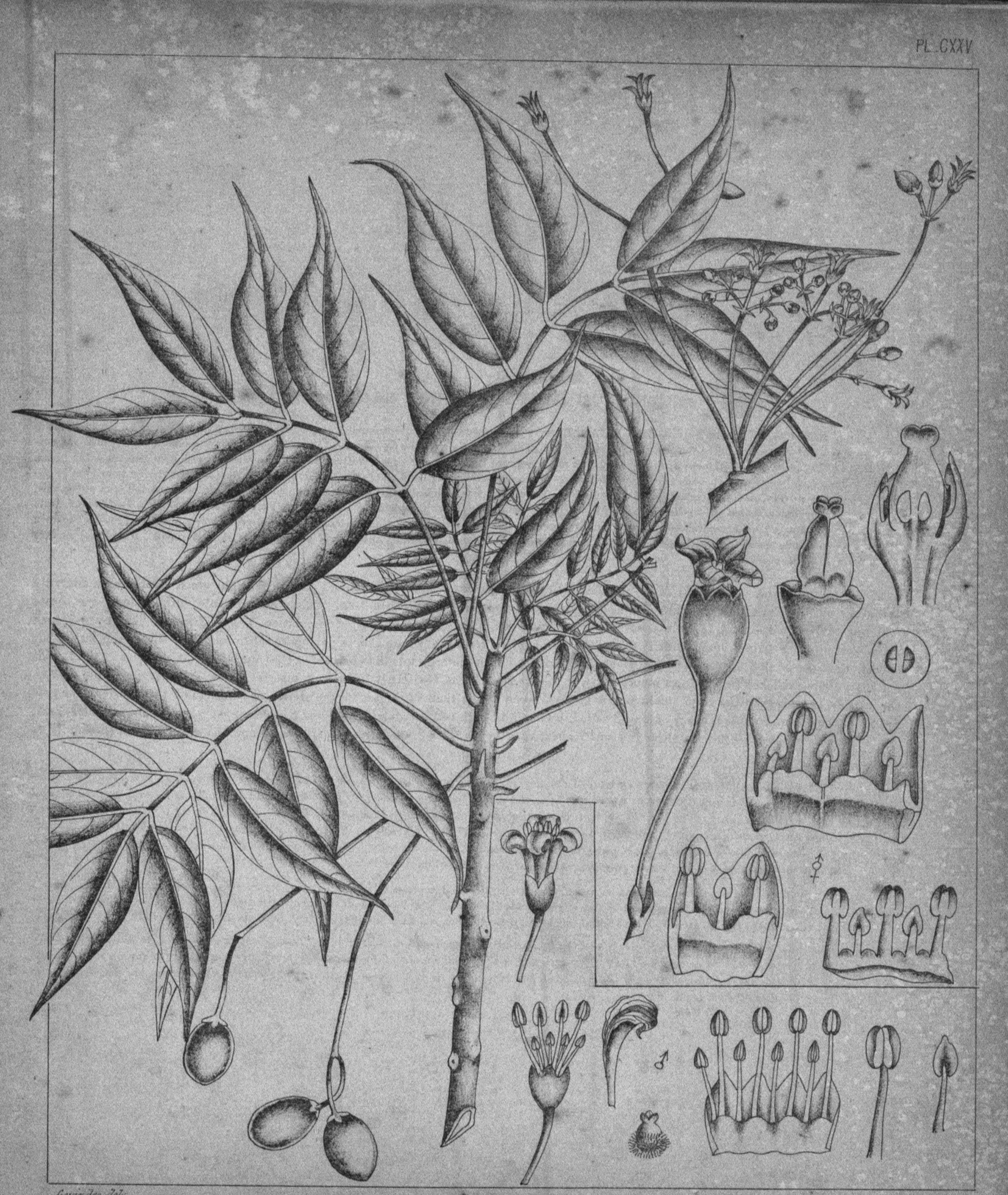
PROTIUM, *Wight and Arnot.*—GEN. CHAR. Flowers polygamous, calyx small tubular 4 cleft or dentate, lobes valvate; petals 4 erect, with the apex recurved and the tips incurved, linear oblong slightly imbricate at the sides with the tips incurved in æstivation; disk urceolate 4 lobed lining the bottom of the calyx, margin free, stamens 8-10 inserted below the margin of the disk on the outside alternately shorter, erect free shorter than the calyx in the fertile flower, much longer than the calyx in the sterile flower, the longer ones rising from the back of the lobes of the disk and the shorter ones from or behind the sinuses; ovary sessile 2-4 celled, style very short or obsolete, stigma 3-4 lobed, ovules 2 in each cell collateral pendulous from the apex of the axis, drupe fleshy globose, sarcocarp at length 4 valved with 1-4 bony 1 seeded pyrenes which are connate at first but at length separating, seed oblong, testa membranaceous, cotyledons membranaceous contortuplicate, radicle superior. Small trees without thorns, bearing resin; leaves alternate towards the apex of the branches, 3 foliate or unequally pinnate, panicles long peduncled crowded towards the apex of the branches, flowers small. *WA. Prod. p.* 176. Protionopsis, *Bl. Mus. Bot.* 1. 229.

PROTIUM CAUDATUM. (WA.) A middling sized tree, bark very smooth and of a bright green color, leaves alternate about the extremities of the branches 3-foliate or unequally pinnate, 3-6 inches long, leaflets 1 to 5 pair with an odd one, quite glabrous on both sides, from broadly ovate to lanceolate with a long terminal sharp acumination, about 2 inches long by ½-1 inch broad, petiolules 2-4 lines long, panicles fascicled supra axillary from the young shoots; about equal in length to the young leaves but shorter than the adults, 2-3 times dichotomous, lax, furnished with filiform apiculate bracteoles (2-3 lines long) at the base of the ramifications; petals reflexed but with an incurved tip at the apex, stamens 8 alternately shorter inserted below the margin of the disk on the outside, shorter than the calyx in the fertile flowers, much longer than the calyx in the sterile, the anthers of the shorter filaments apiculate the others rounded, ovary oblong 2 celled, ovules 2 in each cell collateral pendulous from the apex of the axis, stigma subsessile 3-4 lobed, in the male flowers there is a small abortive ovary with a 3 lobed sessile stigma, drupe the size of a small sloe. *WA. Prod. p.* 176.

This green barked tree is common in most of our dry subalpine jungles on both sides of the Madras Presidency, and is found in Ceylon all over this Presidency; it is very common as an avenue tree, and a very bad one it makes, as it is bare of leaves for some months towards the end of the cold season and beginning of the hot, the young leaves appearing with the flowers in March. It is curious that it is not mentioned by Roxburgh as it is so abundant in some parts of the Northern Circars; it is called Kondà Màmidi in Teligu and Kilevay in Tamil; the whole tree is very odoriferous, the leaves and bark having a strong grateful fragrance something like mangoes. The tree grows most readily from large cuttings, which is the reason it is so often employed for avenue purposes; the wood is said to be worthless.

The figure is from a drawing executed in the Ceylon Herbarium, and represents fertile flowers. My S. Indian specimens quite tally, except that the leaflets are broader and fewer in number, the stigma generally (always?) 3 lobed, and the ovules pendulous instead of ascending; the latter difference is an error of the Ceylon artist. I have added (figure A.) dissections of the male flower taken from fresh specimens collected in this Presidency.

The South Indian species of Protium and the S. Indian Balsamodendron, must be placed under the same genus; the flowers only differ in the former having a 4 lobed disk and the latter a 6 8-crenated disk, and there is no difference in the fruit; the 2 species of Protium are unarmed with long peduncled panicles. Balsamodendron is armed, and has almost sessile inflorescence, but this would not constitute a generic distinction, and the genus Protium of WA. must lapse.



Govindoo del.

Dunsphy, Lith.

Protium caudatum (W.)

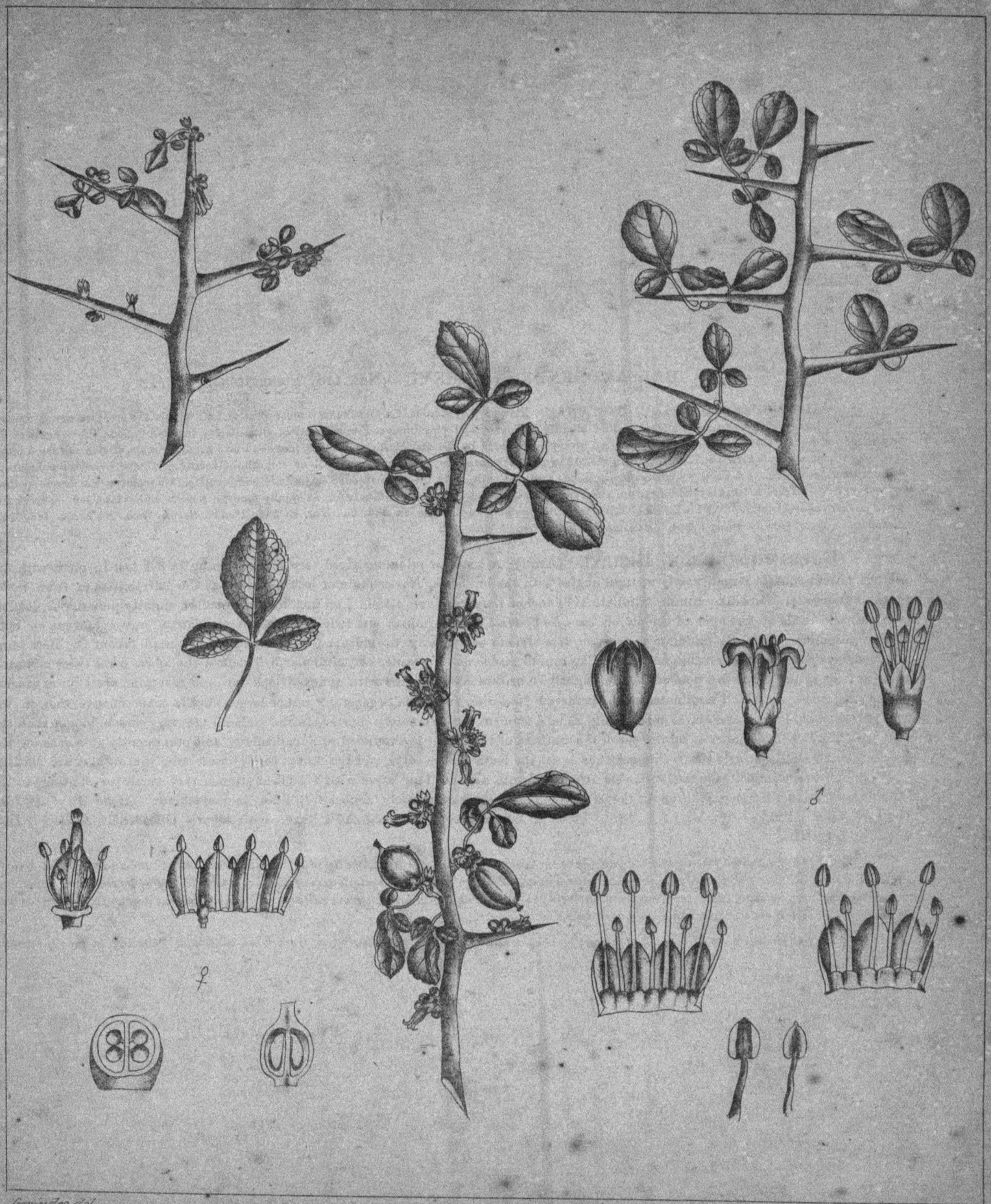
BALSAMODENDRON BERRYI. (Nat. ord. Burseraceæ.)

BALSAMODENDRON, *Kunth.*—GEN. CHAR. Flowers polygamous. Calyx tubular 4 toothed persistent, petals 3-4 erect recurved towards the apex with incurved tips, linear-oblong, the sides slightly imbricate and tips incurved in æstivation, stamens 6-8 inserted outside the margin of the very short 6-8 crenated disk, free, alternately shorter, ovary surrounded by the disk sessile 2-3 celled, narrowed into a longish style, stigma obtuse 4 lobed, ovules 2 in each cell, collateral pendulous, in the male flowers the ovaries are abortive very small or sometimes wanting. Drupe ovoid or subglobose, epicarp 2-4 valved, with 1-3 bony 1 seeded pyrenes, seeds exalbuminous, testa membranaceous, cotyledons contortuplicate sheathing the terete pointed superior radicle. Trees or shrubs yielding resin, generally spinose, leaves alternate 1-3 foliate or unequally-pinnate, flowers small fascicled on thickened nodes or short lateral ramuli or on 1-4 flowered axillary jointed peduncles. *Kunth. in Ann. Sc. Nat.* ii. 348. Heudelotia, *A. Rich. Fl. Seneg.* 150. *t.* 39. Commiphora, *Jacq. Hort. Schœnb. t.* 294. Balsamophleos, *O. Berg. in Bot. Zeit.*

BALSAMODENDRON BERRYI. (Arnt.) A small or middling sized very thorny tree up to 3-4 feet in girth with numerous lateral spinose ramuli nearly at right angles with the branches, leaves more or less fascicled at the extremities or from nodes on the branches or thorn-like ramuli, trifoliate 1-1½ inches long, common petiole ½ an inch long channelled slightly puberulous, leaflets sessile or subsessile at the apex of the petiole cuneate obovate, the terminal one twice as large as the lateral ones, glabrous on both sides from entire or slightly undulate to more or less crenate particularly towards the apex, flowers very small (about 3 lines long) fascicled on nodes on the branches and thorn-like ramuli sessile or subsessile, calyx tubular 3-4 cleft at the apex, corol twice or nearly twice as long as the calyx 3-4 petaled, petals slightly imbricate at the sides with inflexed tips during æstivation, erect in expansion with a recurved apex which terminates in an incurved tip, disk very small (generally rather larger in the male flowers than in the fertile) 6-8 crenated, the crenatures resembling glands, stamens 6-8 alternately shorter, in the male all are very much longer than the calyx and the 3-4 longer ones equal the corol, the anthers of the longer are rounded or subapiculate, and prominently apiculate on the shorter, in the fertile flowers the 3-4 longer ones equal the teeth of the calyx and the others the sinuses only, the anthers are smaller, (and effete ?) ovary large in the fertile flowers attenuated into a rather long style with a 4 lobed stigma, very small (or wanting) in the male flowers, stigma 4 lobed, fruit as in the genus oblong sometimes obtusely angled 6-8 lines long apiculate. *Arnot Ann. of Nat. Hist. vol.* iii. *p.* 85, 86 ;—*Wight, Ill. p.* 185. Protium Gileadense, *WA. Prod.* 176. (exc. syn.) Amyris Gileadensis, *Roxb. Fl. Ind.* ii. *p.* 246 (exc. syn.)

This is a good sized tree in the dry jungles to the east of the Nilgiris (Guzzlehatty pass, &c.) covered with flower and fruit in February and March, all over the Presidency it is very common as a hedge plant but seldom flowering in that state, as the inflorescence is either attacked when young by some insect or rendered abortive from a successive propagation from cuttings. The whole tree has a grateful fragrance and a gum-resin exudes from it, the plant makes an admirable hedge.

I have taken the generic character entirely from the Indian plant, the drawing is from fresh specimens collected in the Coimbatore district.



Gomez del.

Dampney Lith.

Balsamodendron Berryi (Arnt)

CANARIUM BRUNNEUM. (Nat. ord. Burseraceæ.)

CANARIUM, *Linn.*—GEN. CHAR. Flowers hermathrodite or polygamous, calyx urceolate or cupulate 3-5 cleft (rarely only 2) valvate persistent, petals 3-5 as long or longer than the calyx, valvate or imbricate, stamens 8-10 short erect or incurved (6 in some extra-Indian species) inserted on to a long staminal tube, disk obsolete or none, or on the margin or outer side of a fleshy entire or undulate disk, filaments cohering more or less together at the base and with the disk; ovary ovoid 2-3-4 celled, ovules 2 in each cell collateral fixed to the axis, stigma sessile or subsessile, capitate 3-4 lobed, drupe ovoid or ellipsoid often 3 sided with a bony 1 seeded putamen, testa membranaceous, cotyledons contortuplicate, radicle short straight superior. Large trees yielding resin, leaves alternate pinnate with or without stipules, the lowest pair of leaflets occasionally resembling stipules, leaflets opposite entire or crenulate, panicles axillary, flowers small.—Scutinanthe, *Thw.* Colophonia, *Comm.* Pimela, *Lour Fl. Cochin.* Canariopsis, *Blume Mus. Bot.* 1. 222.

CANARIUM BRUNNEUM. (Thw.) A tree 50 or 60 feet high, branchlets and young leaves rufo-tomentose, leaves unequally pinnate 10-20 inches long, leaflets 5-11, oblong slightly oblique acuminate, entire, 4-8 inches long 2-3 broad reddish, petiolules 4 lines long sulcate above, tumid at the base, striated, panicles axillary many flowered tomentose, flowers 3 lines long, sepals 5 erect, petals 5 valvate fleshy coriaceous persistent, the length of the calyx, stamens 10 cohering in the lower part in a ring and consolidated with the base of the calyx and corol, anthers oblong introse, fixed by their back, ovary 2 celled, drupe oblong rufo-tomentose attenuated at both ends about 1 inch long, cotyledons undivided. *Thw. En. Pl. Zey. p.* 410. Scutinanthe brunnea, *Thw. Hook. Journ. of Bot.* viii. *p.* 266. *t.* 8 *& En. Pl. Zeyl. p.* 78.

Ceylon, in the Central provinces, at an elevation of 2,000-3,000 *feet, called Mahabulumora.*

Corvindo, del.

Canarium brunneum (Thw:)

Dumphy, Lith:

BENGAL SECRETARIAT
LIBRARY.

CANARIUM STRICTUM. (Nat. ord. Burseraceæ.)

CANARIUM STRICTUM. (Roxb.) A very large tree, polygamous, trunk tall and straight; young branches, petioles, panicles, and costa beneath, densely rufo-tomentose, leaves equally or unequally pinnate 1-4 feet long, by 10-20 inches broad, leaflets brilliant-red when young and densely tomentose on both sides, at length glabrous and shining above, soft and densely tomentose beneath, (the tomentum being reddish on the costa and veins but otherwise whitish) ovate to oblong, acuminate, often very unequal at the base, about 4-7 opposite or subopposite pair with or without a long petioluled odd one, more or less crenulate or serrate particularly when young or subentire, 5-12 inches long by 3-6 broad, petiolules about 3 lines long; panicles axillary densely rufo-tomentose (as is the calyx) a little shorter than the leaves, flowers white crowded towards the apex of the pedicels, calyx cupular 3-4 fid valvate persistent, petals 3-4 more than twice as long as the calyx much imbricate, slightly hairy on the outside towards the apex; male flowers, disk none, staminal tube submembranaceous as long or a little longer than the calyx terminating in 6-8 filaments which are ⅓rd the length of the calyx slightly dilated at the base and attenuated upwards, anthers oblong slightly acute dehiscing longitudinally attached at the back slightly above the base, rudiment of the ovary small 6 lobed glabrous below densely hairy towards the apex; female flower unknown, drupe oval tapering at both ends, putamen hard woody 3 celled.

This very beautiful tree is most abundant in all the moist ghat forests on the western side of the Madras and Bombay Presidencies up to 4,000-4,500 feet, but it does not occur in Ceylon or elsewhere, and it is never seen in dry forests, its brilliant crimson foliage makes it a most beautiful sight when in young leaf, the leaves of saplings and young trees are very much larger than those of adults, the tree is known as the "black dammer" to Europeans and is called Karapu Kungiliam in Tamil; but also receives the names of Googal and Dhup, and in S. Canara Mandà Dhoop, a brilliant black dammer exudes from incisions in the trunk which is a considerable article of trade with some of our hill tribes, this dammer is used medicinally and for various purposes; it is insoluble in cold, but partially soluble in boiling alcohol with the addition of camphor; when powdered it is readily soluble in oil of turpentine, it emits a more resinous smell and burns with more smoke than the Vateria resin, a small piece makes an excellent "fire reviver," the tree flowers early in the year, generally in January or February, but sometimes as late as April. I am not acquainted with the timber.

The following is Mr. Broughton's report upon some of the resin submitted to him for chemical analysis.

This well known substance offers little chance of usefulness in Europe, at least when the many resins are considered that are found in the market at a far less price. It is used in this country for many small purposes, as in the manufacture of bottling wax, varnishes, &c. Its colour when in solution is pale compared with its dark tint when in mass. Though insoluble in spirit, its solution in turpentine forms a tolerable varnish. When submitted to destructive distillation it yields about 78 per cent of oil resembling that obtained from common colophony. But I fear in the majority of its possible applications it possesses few advantages over ordinary resin at 7s. 6d. per cwt. The number of substances suitable for coach varnishes have lately become very numerous in Europe, common resin is now purified by a patent process consisting of distillation with superheated steam, by which it is obtained nearly as transparent and colorless as glass, in such amount that a single firm turns out 60 tons per week.

The figure represents a branch in bud, and nearly the whole of a panicle from a male tree. Fig i. is the stamen tube from a 3 merous male flower; fig. ii. the same from a 4 merous flower; iii. abortive 6 lobed ovary opened out. In the plate are also analysis of the flowers of Canarium commune and C. Zeylanicum (communicated by Dr. Thwaites.)

Govindoo, del.

Humphry, Lith.

Canarium strictum (Roxb.)

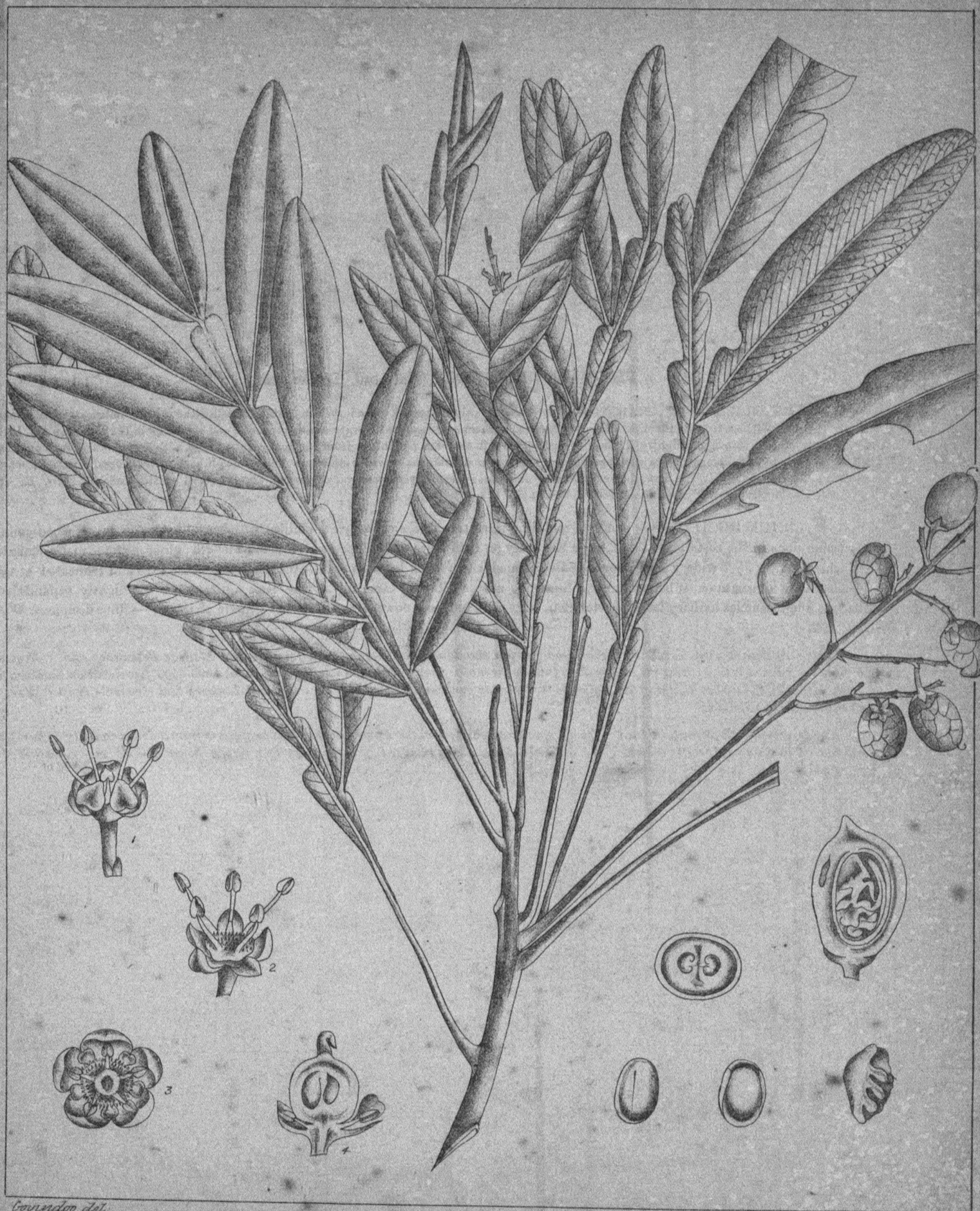
FILICIUM DECIPIENS. (Nat. ord. Burseraceæ.)

FILICIUM. *Thw.*—GEN. CHAR. Flowers polygamous, calyx 5 parted, lobes imbricate, petals 5 small without scales imbricate, disk tomentose 5 lobed, stamens 5 inserted on the disk, filaments filiform, anthers ovate-sagittate, ovary sessile globose 2 celled (sterile in the male flowers), style short uncinate, stigma simple or slightly 2 lobed, ovules solitary in the cells pendulous from the apex, drupe fleshy with a membranaceous putamen 1-2 celled 1-2 seeded, seed oblong, testa membranaceous, embryo exalbuminous curved, cotyledons foliaceous plicate, radicle dorsal directed towards the hilum and nearly reaching it. A tree, leaves alternate coriaceous unequally pinnate, rachis winged, flowers small white panicled. *Thw. En. Pl. Zeyl. p.* 408. Pteridophyllum, *Thw. in Hook. Kew. Journ.* vi. 65. *t.* 1.

FILICIUM DECIPIENS. (WA.) A middling sized tree all the young parts clothed with scurf like scales, leaves when young slightly puberulous in the costa beneath, more or less scaly on both sides and slightly glutinous at length glabrous, unequally pinnate 10-15 inches long by 3½-7 wide, rachis interruptedly winged, the portion between each leaflet tapering at the base and truncated at the apex, leaflets 6-12 alternate or subopposite pair, linear to narrow oblong tapering at the base quite entire or slightly repandulate towards the apex, panicles axillary large shorter than the leaves angled ; flowers, &c. as in the generic character.—Rhus decipiens, *WA. Prod. p.* 172.

This very elegant fern-leaved tree is found more or less throughout the Western ghat forests of the Madras Presidency and in Ceylon, and has been introduced into gardens ; it is very abundant in the moist forests of the Anamallays at about 4000-4500 *feet elevation and also at much lower altitudes, the timber is strong and valuable for building purposes, it flowers in December and January and ripens its fruit in March, in Ceylon it is called Pehimbia.*

The drawing of the branch in fruit is from a specimen collected on the Annamallays. The analysis is from a drawing by Dr. Thwaites. i. *a male flower* ; ii. *the same petals removed* ; iii. *a fertile flower ovary removed* ; iv. *a section of a fertile flower showing the ovules and the position of the stamens.*



Connidoo, del.

Filicium decipiens (WA)

Murray, Lith.

AGLAIA ROXBURGHIANA. (Nat. ord. Meliaceæ.)

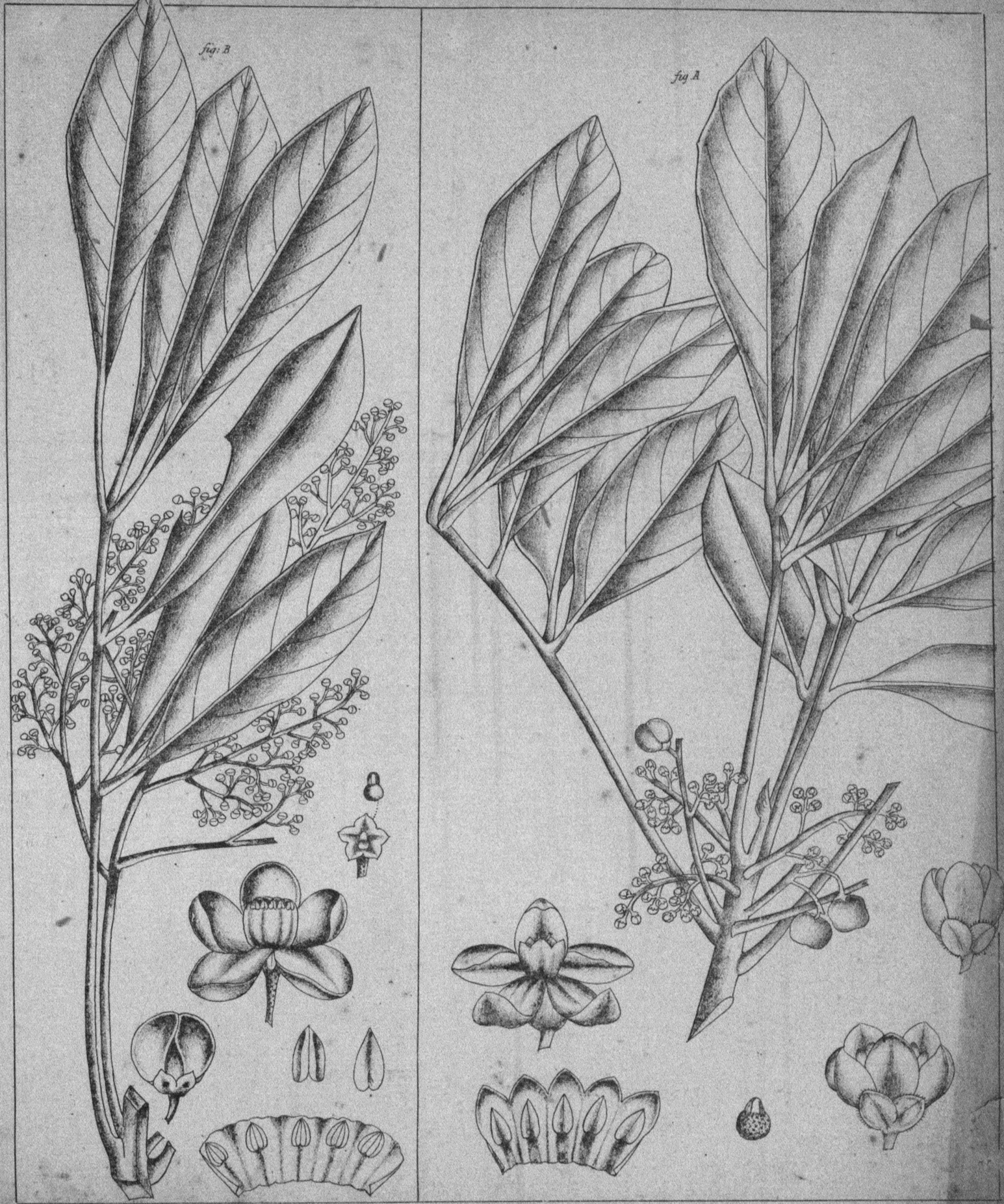
For Gen. Char. see under "Meliaceæ" in the Manual.

AGLAIA ROXBURGHIANA. (WA.) A large tree polygamous, all the young parts more or less scurfy with reddish scales, leaves unequally pinnate 6 inches to 1 foot long, leaflets opposite or alternate 2-4 pair with an odd one, always more or less lanceolate but sometimes obovato-lanceolate to obovate spathulate, quite entire, paler beneath, 2-5 inches long by 1-1½ broad, petiolules 2-6 lines long, panicles axillary all more or less scurfy from much shorter to longer than the leaves, generally longer and more compound in the male, and shortened in the fertile, flowers very small generally a little larger in the fertile, pedicels 1-3 lines long, calyx 5 fid scaly or glabrous and often ciliate, petals 5 often scaly on the outside when young, staminal tube subglobose from nearly entire to 5 toothed or lobed, anthers 5 sessile (but the tube immediately below each anther is often more or less thickened and gives the appearance of there being a regular filament) quite included or their apices slightly protruded above the tube, fruit from nearly globose to pear-shaped.—Milnea Roxburghiana, *WA. Prod. p.* 119. Milnea apiocarpa, *Thw. En. Pl. Zey. p.* 60.

Very common throughout the ghat forests on the western side of Madras Presidency up to 4,000 feet, and in parts of Mysore, &c., and in Ceylon; it is very variable in the shape of the leaves and fruit and amount of pubescence, the timber is strong and useful for building, the tree generally flowers in March and April, but I have also seen it in flower at other seasons. Fig A represents a common form (a branch of the fertile tree with dissection of flowers of the male tree). B is a variety from the Tinnevelly hills (Attraymallay ghat) a male tree with dissections of the flowers, this variety has the leaves obovate-spathulate, the dissections are all from male flowers, but the female flower only differs in having a fertile ovary.

One variety or species in my Herbarium, a large tree from South Canara which I refer doubtfully to this species, has the leaves about 2 feet long and the leaflets ovate-lanceolate from a broad base 7 inches long, male panicles nearly as long as the leaves and very compound, flowers in no way differing from those of Roxburghiana (fig. A), fertile flowers and fruit not seen.

Fig A is a branch of a fertile tree in young bud and young fruit, and dissections of male flowers (all from the Annamallays). Figure B is a male tree and dissections of the flowers (from South Tinnevelly.)



Govindoo, del. Dunphy, Lith.

Aglaia Roxburghiana (WA)

Mimusagynum (Wall)

LANSIUM ANAMALLAYANUM. (Nat. ord. Meliaceæ.)

LANSIUM. *Rumph.*—GEN. CHAR. Flowers diœcious, sepals 5 rounded imbricate, petals 5 rounded connivent imbricate, staminal tube globose crenulate at the mouth, anthers 10 alternately shorter, the apices of the 5 longer ones just exserted, disk inconspicuous, ovary globose 3-5 celled, style very short thick, stigma truncate 3-5 lobed or radiate, ovules 1-2 in each cell fixed to the axis, berry with a rind 5-celled or by abortion 1-4 celled indehiscent, cells 1-2 seeded. Seed solitary or twin collateral oblong, hilum ventral, aril pulpy covering the whole seed, testa coriaceous, cotyledons transverse, radicle superior. Trees, leaves unequally pinnate, flowers small in axillary racemes or panicles or branched spikes, berry yellow or red, aril sometimes edible.—Sphœrosacme, *Wall. in part.*

LANSIUM ANAMALLAYANUM. (Bedd.) A good sized tree, leaves 6-9 inches long unequally pinnate, glabrous, leaflets 3-5 elliptic obtusely acuminate, attenuated at the base, entire, 3-4½ inches long by 1½-2 broad, furnished with hairy glands in the axils of the veins beneath, petiolules about ½ an inch long, flowers in axillary panicled spikes, peduncle very short 1-2 lines long, branchlets 2-3 inches long, flowers pentamerous hermathrodite (always ?) yellow, about 2 lines in diameter, sepals imbricate rounded ciliate, with 1-2 minute bracts at the base, petals about twice as large, imbricate, rounded at the apex, stamen-tube obsoletely 5 cleft, anthers 10 alternately shorter, the 5 longer ones just appearing above the apex of the tube, filaments adglutinate to the tube and not separable with the anther, ovary densely strigose sessile on a very small disk, 3 lobed 3 celled, ovules 1 in each cell attached to the axis near the base (or 2 ovules in each cell ?) style very short or obsolete, stigma large obtusely 3 lobed, fruit oblong with a dry greyish rind size of a grape, 2 celled, 2 seeded, seed completely covered with a very succulent aril. *Bedd in Linn. Trans. vol.* XXV., *and Icones Plant. Indiæ tab.* CIV.

I formerly described the ovary cells as 2 ovuled, though I only figured them as 1 ovuled; in dissecting several flowers I now find only 1 ovule in each cell, but it probably varies.

A handsome tree, common in the dense moist forest of the Anamallays (particularly in the Anagoondy shola) at an elevation of about 2000 feet, also in Malabar (foot of the Nilgiris); it flowers early in April, and the fruit ripens in July, the succulent aril in the latter is greedily eaten by monkeys and birds; it is the only species of the genus found in the Peninsula, one species occurs in the Himalayas and a third in Java.

Govindoo del.

Dampier Lith.

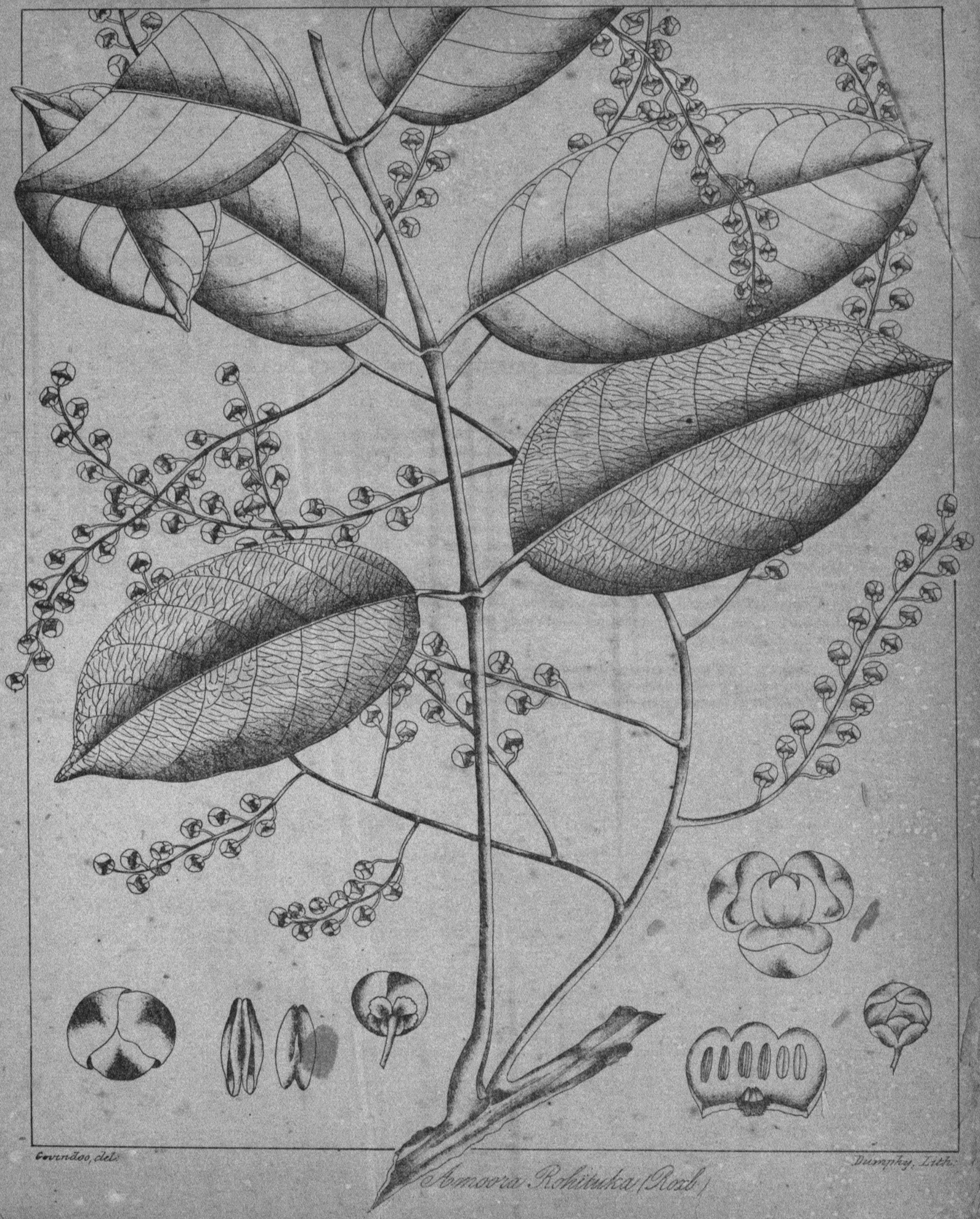
Santalum Anamullayanum (Beddome)

AMOORA ROHITUKA. (Nat. ord. Meliaceæ.)

For Gen. Char. see under this genus in the Manual.

AMOORA ROHITUKA. (Roxb.) A small or middling sized tree, polygamous, trunk pretty straight, bark smooth ash colored, leaves alternate unequally pinnate 1-2 feet long, leaflets 4-8 pair opposite obliquely oblong glabrous shortly pointed at the apex 3-6 inches long by 2-2¾ broad, petiole less than ½ an inch long slightly pubescent when young at length glabrous inflorescence axillary, panicled on the male tree, and spiked on the fertile. Male panicles axillary or a little above the axils somewhat drooping very large and much branched, but shorter than the leaves, flowers numerous, pedicels 2-3 lines long, calyx 5 parted imbricate, petals 3 oval to orbicular concave imbricate, stamen-tube globular bluntly 3 lobed at the apex, anthers 6 sessile included, or with the apices just appearing at the mouth of the tube attached by the centre of their back to the tube, a small rudiment of an ovary hairy at the base and 3 lobed at the apex, fertile spikes ½ or a little more than half the length of the leaves, flowers as in the male except that they contain a fertile ovary which is 3 celled with 2 ovules in each cell superposed and attached to the middle of the axis, stigma subsessile 3 lobed, lobes emarginate, capsule round reddish 1½ inches in diameter a little attenuated at the base, 3 celled 3 valved opening from the apex, seed oblong with a brown testa enclosed completely in a fleshy scarlet aril.—Andersonia Rohituka, *Roxb. Fl. Ind.* ii. 213.

This tree is met with sparingly throughout the Western ghat forests of the Madras Presidency up to 3500 *feet elevation in Bengal and in Ceylon (where it is called Hingoot), it is rather common in the Anamallays, an oil is extracted from the seed in Bengal. The specimen figured and the dissections are all from a male tree gathered in the Anamallay hills.*



Covendoo, del.

Dumphy, Lith.

Amoora Rohituka (Roxb.)

ORDER XXV—CHAILLETIACEÆ.

Flowers hermathrodite or unisexual, sepals 5 connate below or free, equal or unequal, imbricate, petals 5 more or less exceeding the calyx free and equal or more rarely more or less connate with the stamens, usually more or less unguiculate 2-fid or 2-partite; stamens 5 alternate with the petals (or rarely united with them), anthers 2 celled elliptical to linear the connective often dorsally thickened; hypogynous glands opposite to the petals free or connate, ovary free (rarely inferior in some extra-Indian examples) 2-3 celled, styles 2-3 (rarely only 1 in species not Indian) free or connate short or elongate, stigmas capitate or simple, ovules geminate, drupe oblong or compressed pubescent dry or fleshy, the epicarp opening and disclosing the putamen or indehiscent putamen 1-2 celled, bony or crustaceous sometimes dividable, cells 1 seeded, seeds pendulous, testa membranaceous, albumen none, embryo large, cotyledons amygdaloid, radicle superior small. A small order only represented by 1 small tree in S. India.

CHAILLETIA. DC.

Gen. Char.: Flowers hermathrodite or unisexual; calyx 5 parted, lobes nearly or quite equal more or less imbricate, petals 5 usually more or less clawed 2 fid or 2 partite, rarely very shortly united with the stamens into a tube at the base; stamens 5, anthers elliptical to linear the connective frequently thickened behind, hypogynous glands 5 distinct or connate opposite to the petals. Ovary free (rarely inferior in species not Indian), styles 2-3 (rarely 1 only) free or connate short or elongate, stigmatose at the apex, drupe coriaceous dry or fleshy, putamen 1-2 (rarely 3) celled crustaceous or bony. Small trees or shrubs, pubescent or glabrous, leaves alternate entire, flowers small usually white in axillary pedunculate or nearly sessile cymes or glomerules. *DC. in Ann. Mus.* 17. 153. Moacurra, *Roxb. Fl. Ind.* ii. 69. Wahlenbergia, *Br.* Symphyllanthus, *Vahl.* Dichapetalum, *Thouars.* Leucosia, *Thouars.* Quilesia, *Blanco.*

1. Chailletia gelonioides, *Roxb.*—A small tree or often only a shrub, bark rough, young shoots villous and yellowish, leaves alternate short petioled broad lanceolate entire taper-pointed membranaceous 3-4 inches long by 1¼ broad, stipules subulate villous, flowers numerous small on axillary solitary short peduncled fascicles, calyx-segments oval hoary, petals free the length of the calyx but narrower and smooth, glands 5 small oval, ovary (in the fertile flowers only) ovate cordate a little compressed downy 2 celled with 2 ovules in each, pendulous from the apex of the cells, styles 2 recurved, stigmas somewhat 2 lobed, capsule transversely oval 2 lobed soft with grey or whitish down, size of a nutmeg, epicarp opening, putamen dividable into 2.—Moacurra gelonioides, *Roxb. Fl. Ind.* ii. p. 69. Chailletia, *Benth. & Hook. Gen. Pl.* 1. *p.* 341.

This small tree or shrub is very common in all the Western ghat forests of the Madras Presidency up to 4000 feet elevation, also in Ceylon, and Bengal (where it is called Moakurra.)

Analysis of Genera, Pl. IX, fig. 1.

Chailletia gelonioides.

1 & 2. Bud and flower, showing the imbricate sepals.
3. A male flower opened.
4. A petal removed.
5. Anthers.
6. Ovary from a fertile flower.
7. The same cut vertically.
8. A fruit.

ORDER XXVI—OLACINEÆ.

Flowers regular, hermaphrodite or unisexual. Calyx small, 4-5 toothed, fid, or partite, occasionally nearly entire or obsolete, unchanged or accrescent in fruit. Petals 4-5, free or connate more or less, usually valvate in æstivation. Stamens 4-10, rarely 12-40 free or united below more or less to the petals, rarely monadelphous; anthers 2-celled. Disk cupuliform entire or lobed, rarely unilateral, or 0. Ovary free or the lower part immersed, 1-celled or 3-5-celled, the dissepiments frequently incomplete above. Style simple. Ovules solitary in each division of the ovary (rarely several in each cell) or geminate in 1 celled ovaries, pendulous. Fruit 1 celled, 1 seeded, dry or drupaceous, indehiscent. Seed usually with a copious fleshy albumen, rarely exalbuminous; embryo minute, apical, or shorter than or nearly equalling the albumen, with foliaceous cotyledons. Trees or shrubs. Leaves alternate, entire or nearly so, usually penniveined; exstipulate. Inflorescence various. Flowers small.

* Stamens mixed with staminodia... ... ...Olax.
** Stamens all fertile as many as the petals and opposite to them.
Calyx accrescent in fruit, ovary 3-5 celled nearly to the apex... ... ...Strombosia.
Calyx unchanged, but disk enlarging with the fruit, ovary 1 or imperfectly 2 celled, ovules 2-3 ... ...Anacolosa.
Calyx unchanged, disk of 4-5 scales surrounding the ovary, ovary 1 celled 1 ovuled ... .Opilia.
*** Stamens all fertile as many as the petals and alternate with them.
† Petals glabrous or subglabrous.
Anthers tufted with soft hairs, flowers capitate in umbellate spikes ... ...Lasianthera.
Anthers glabrous, or very slightly pilose, flowers in axillary or lateral cymes, stigma sessile large discoid...Gomphandra.
Anthers glabrous, style eccentric or oblique, stigma small... ... ...Apodytes.
†† Petals villous. ... ...Mappia.

Not an order of much importance, but little is known of the timber of any of its representatives; the genera Strombosia, Anacolosa, and Lasianthera each furnish a single species, lofty trees, the first found in the Western ghat forests of S. India and in Ceylon, the second only detected as yet in the dense forests of the Anamallays, and the third peculiar to Ceylon. Olax is represented by two small trees, both common to Ceylon, and one found all over the Madras Presidency. Opilia has a single species, a straggling weak

tree or shrub common throughout this Presidency and in Ceylon. Gomphandra two small trees or large shrubs common throughout the western forests of this Presidency and in Ceylon. Apodytes and Mappia each give a middling sized tree common to Ceylon and the western forests of Southern India, the latter is very fetid when in blossom ; the only other plant belonging to this order (in S. India) and not coming within the scope of this Flora is a climbing species of Olax, Wight's genus. Bursinopetalum is Mastixia of Blume and belongs to Cornaceæ.

OLAX. LINN.

Gen. Char. : Calyx cupuliform entire or nearly so, small whilst flowering, at length often accrescent and enclosing the fruit, petals 5-6 valvate free or slightly coherent or connected by alternating filaments, stamens generally 3 antheriferous alternate with the petals, and 5 anantherous and opposite to them, or occasionally 5 antheriferous and opposite the petals, and 3 anantherous and alternate, anthers ovate versatile, filaments more or less adnate to the petals, ovary 1 celled above and more or less 3 celled at the base narrowed into a style, ovaries 3 pendulous from the apex of the central placenta, stigma obtuse or 3 lobed, drupe oblong or globose enclosed within the accrescent calyx or naked, nut crustaceous 1 seeded, seed spuriously erect, embryo minute oblong in the apex of copious albumen. Glabrous trees or shrubs, leaves alternate entire or nearly so, flowers small in short racemes or the common peduncle nearly obsolete, rarely solitary.—Spermaxyrum, *Labill.* Fissilia, *Comm.* Lopadocalyx, *Kl.* Pseudaleia and Pseudaleioides, *Thouars.*

1. OLAX ZEYLANICA, *L.*—A small tree, erect, young branches acutely angled glabrous transversely rugulose, leaves glabrous shining ovate acuminate about 2 inches long by ¾ of an inch broad, racemes axillary very short few flowered, pedicels short and each covered with a bract as long as itself, sterile filaments with their apices bifid. *DC. Prod.* 1. 532 :—*WA. Prod. p.* 88 ;—*Thw. Pl. Zey. p.* 42. Ceylon, abundant at the south of the island, called Malla, the leaves are eaten in curries.

2. OLAX WIGHTIANA, *Wall.*—A shrub or small tree, branches terete glabrous, leaves ovate or oblong quite glabrous upper side shining under pale, 3½-4 inches long, by 1½ broad, petioles about 3 lines long, racemes axillary about 1 inch long often several together lax usually compound, pedicels about 4 lines long many times longer than the subtending bractes, petals usually 5, sterile anthers bifid. *Wall. L. n.* 6779 ;—*WA. Prod. p.* 89.

Easily distinguished from Zeylanica (and from O. scandens, a climbing plant) by its lax racemes and flowers double the size. Common throughout the Madras Presidency and in Ceylon.

Analysis of Genera, Pl. IX, fig. 2.

OLAX WIGHTIANA.

1. A bud showing the obsoletely lobed calyx, the bract much smaller than the pedicel and the valvate petals.
2. Corol opened showing the 5 petals, the 3 fertile stamens, 2 of which are alternate with the petals and the 3rd placed on one of the petals a little to its side, and the 5 sterile bifid stamens each opposite to a petal, all 8 being adnate to the petals.
3. A flower, the corol removed, showing the young ovary, the style 3 ribbed towards the apex and the 3 stigmas.
4. The ovary in a more advanced stage showing the accrescent calyx.
5. Fertile anthers, front and back view.
6. Ovary cut vertically, showing that it is 1 celled at the apex with the placentas rising from the base, bearing 3 pendulous ovules at their apex.
7. The base of the ovary cut horizontally, showing the 3 cells and 3 ovules.

STROMBOSIA. BL.

For Gen. Char. see letter press to Pl. cxxxvii.

1. STROMBOSIA CEYLANICA, *Gardn.*—For description, &c. see Pl. cxxxvii.

ANACOLOSA. BL.

For Gen. Char. see letter press to Pl. cxxxviii.

1. ANACOLOSA DENSIFLORA, *Bedd.*—For description, &c. see Pl. cxxxviii.

OPILIA. ROXB.

Gen. Char. : Calyx minute, 5 or rarely 4 toothed. Petals 5, rarely 4 hypogynous, valvate in the bud. Stamens as many opposite to the petals, free, filaments filiform ; anthers ovate. Disk of 5, rarely 4 scales, alternating with the stamens. Ovary 1 celled, tapering into a short thick truncate style ; ovule solitary, erect. Drupe with a thin sarcocarp and crustaceous endocarp. Seed erect ; embryo linear, short, or nearly as long as the albumen. Shrubs or small trees, sometimes climbing. Leaves alternate, entire. Flowers in axillary racemes ; pedicels 3 together in the axils of peltate bracts, which are imbricate at an early stage, but fall off before the flowers expand.

1. OPILIA AMENTACEA, *Roxb.*—A scrambling half climbing shrub or small weak tree, glabrous, or the young leaves and shoots minutely tomentose pubescent. Leaves petiolate, ovate lanceolate, or almost oblong, acute or acuminate, 2 to 3 or even 4 inches long, or rarely shorter and very obtuse, entire, thinly coriaceous, the veins usually prominent though fine. Racemes before flowering resembling little cylindrical cones of ½ inch; the peltate imbricate but almost squarrose bracts alone visible, when in flower slender, about 1 inch long without bracts. Flowers very small, on filiform pedicels of about 1 line. Petals about ½ line long, very deciduous. Drupe ovoid or globular, ½ to ¾ inch long. Embryo linear, nearly as long as the albumen. *Wight Illust. t.* 40. O. Javanica, *Miq. Fl. Ind. Bat.* i. *part* i. 784 ;—*Roxb. Pl. Corom.* ii. 31. *t.* 158 ;—*Benth. Fl. Aust. vol.* i. 394.

Not uncommon in jungles throughout the plains of the Madras Presidency and in Ceylon.

Analysis of Genera, Pl. IX, fig. 3.

OPILIA AMENTACEA.

1. A bud, showing the obsoletely toothed calyx and the valvate petals.
2. A flower, showing the 5 large glands alternate with the stamens the latter being opposite the petals
3. The same, petals removed
4. Anthers, front and back view.
5. The ovary.
6. The same cut vertically, showing the erect ovule (not pendulous as figured by Wight and as generally described).
7. The ripe fruit.
8. The same cut horizontally, showing the seed with the central cylindric embryo.
9. Seed cut vertically, showing the embryo nearly as long as the seeds.

All drawn from fresh specimens collected at the foot of the Nilgiris.

LASIANTHERA. P. DEBEAUV.

For Gen. Char. see letter press to Pl. cxxxix.

1. LASIANTHERA APICAULIS, *Thw.*—For description, &c. see Pl. cxxxix.

GOMPHANDRA WALL.

Gen. Char.: Flowers polygamous subdiœcious, calyx cupulate minute 4-6 toothed, petals 4-6 inserted on a very small hypogynous disk valvate with incurved tips more or less cohering in a tube free at the apex, filaments as many hypogynous alternate with the petals and slightly coherent with them at the base or free distinct or more or less connate into a tube, anthers adnate to the inside of the apex of the filaments sessile or nearly so or attached by their back to a longish thread, ovary 1 celled, stigma sessile broadly discoid, ovules 2 pendulous, drupe oblong, putamen crustaceous, seed pendulous, albumen fleshy 2 dividable somewhat resembling the fleshy cotyledons, embryo small apical. Small glabrous or pubescent trees or large shrubs, leaves entire, flowers small cymose.—Stemonurus, *Bl. Bijdr.* 648, ex part. Platea, *Thw.* (not *Blume.)*

1. GOMPHANDRA AXILLARIS, *Wall.*—A small tree or large shrub glabrous or the branches minutely puberulous, leaves submembranaceous conspicuously veined and veinlets very finely reticulated, very variable in shape from narrow lanceolate to almost orbicular terminating in a rather long acumination from 2½ to 5½ inches long, ½-2½ broad, glabrous on both sides or slightly puberulous when young, petioles ¼-½ inch long, cymes pubescent short axillary many flowered in the male, few flowered in the female, calyx very small, petals 4-5 glabrous about 3 lines long, much united, filaments 4 5 hairy at the apex, anthers sessile or subsessile within the apex of the filament just appearing above the petals, ovary small oblong smooth, stigma large fleshy, drupe oblong smooth. *Wall. in Roxb Fl. Ind.* ii. 328 *under* Lasianthera tetrandra. Gomphandra polymorpha, *Wight Ill.* 1. *p.* 103, *& Icones t.* 954. Stemonurus axillaris, polymorphus, Ceylanicus and Heyneanus, *Miers in Ann. of Nat. Hist. Ser.* 2. *vol* x. *p.* 37-42.

Very common in all the western forests of the Madras Presidency and in Ceylon, from the plains up to 4,000 feet elevation.

2. GOMPHANDRA CORIACEA, *Wight.*—A small tree or large shrub glabrous or the young parts, leaves, &c minutely puberulous; leaves coriaceous opaque and inconspicuously veined, generally shining above, as variable and similar in shape and size as the last species, and from scarcely acute to a long narrow acumination, cymes pubescent longer than in the last species, flowers 4 6 merous, anthers attached by a thread to the inside of the filament, the rest as in axillaris, but the filaments are less hairy. *Wight Ill.* 1. p. 103 G. polymorpha, *Icones Pl.* 953. Stemonurus Gardneri & Walkeri, *Miers. l. c.* Platea Wightiana, *Miers. l. c.*

Very common on the Nilgiris, Pulneys and Anamallays at the higher elevations, and throughout the western forests of the Madras Presidency and in Ceylon from an elevation of about 3000 feet to 7000.

Analysis of Genera, Pl. IX. fig. 4.

GOMPHANDRA CORIACEA.

1. A bud, showing the slightly toothed calyx and valvate sepals.
2. A flower open.
3. A flower, corol removed, shewing six filaments inserted into the bottom of the calyx round the disk.
4. The same open, showing the ovary and disk.
5. A corol removed, showing the six coherent but easily separable valvate petals and the inflexed tips.
6. Filament, back view, shewing the weak white hairs at its apex.
7. The same inside view, showing the anther as it naturally appears.
8. The same, showing that the anther is really attached by its back to a minute filiform true filament, which latter is attached to the apparent filament (in reality a stamnal tube) below the apex on the inside.
9. Ovary but vertically, showing its single cell and 2 pendulous ovules.
10. A fruit.

All drawn from fresh specimens collected on the Nilgiris. As far as I can make out from my dried specimens of G. axillaris, the anther is always sessile or subsessile within the apex of the filament; it certainly never has such a long thread as in this species; both are probably 4 6 merous, and the filaments are sometimes quite free and at other times quite consolidated into a tube. I almost doubt their being distinct species, and think that coriacea may be a higher level coriaceous variety of Wallich's axillaris. I have a great variety of forms in my Herbarium.

APODYTES. E. MEYER.

For Gen. Char. see letter press to Pl. cxl.

1. APODYTES BENTHAMIANA, *Wight.*—For description, &c. see Pl. cxl.

MAPPIA. JACQ.

For Gen. Char. see letter press to Pl. cxli.

1. MAPPIA FŒTIDA, *Miers.*—For description, &c. see Pl. cxli.

ORDER XXVII—ILICINEÆ.

Flowers regular, hermaphrodite or unisexual, calyx of 4-6 (rarely 3) sepals, imbricate, usually persistent, petals 4-6 (rarely 3) hypogynous, imbricate in the bud, sometimes united in a lobed corolla. Stamens of the same number as petals and alternate with them hypogynous, free or adhering to the corolla at the base, anthers 2 celled opening inwards. Disk none except the thickened base of the ovary. Ovary free 3 to 5 celled, rarely many celled; stigma broad or capitate, sessile or supported on a distinct style. Ovules 1 or 2 in each cell, pendulous, with a superior micropyle. Fruit a drupe, with as many one-seeded pyrenes as cells. Seeds pendulous, testa membranous, embryo very small in the apex of a fleshy albumen. Trees or shrubs. Leaves alternate, simple, without stipules. Flowers small, in axillary umbels or cymes, rarely solitary or terminal. Fruit small.

A small order only represented in India by the genus Ilex, which has 5 species in South India and Ceylon. Ilex Wightiana, denticulata and Malabarica, large timber trees, and I. Gardneriana and Walkeri small trees; the first and second are common to the western forests of Madras and to Ceylon; the third and fourth are only found in our western forests; and the fifth only in Ceylon. The common English holly, *Ilex aquifolium*, has been introduced on the Nilgiris, but will not make any growth.

ILEX. LINN.

For Gen. Char. see letter press to plate of I. denticulata, Pl. cxlii.

1. ILEX DENTICULATA, *Wall.*—For description, &c. see Pl. cxlii.

2. ILEX MALABARICA, *Bedd.*—For description, &c. see Pl. cxliii.

3. ILEX WIGHTIANA, *Wall.*—A very large umbrageous tree, glabrous or the young parts very minutely puberulous, leaves alternate from ovate to ovate elliptic acute, acuminate or mucronate, coriaceous quite entire, dark green and shining above a little paler beneath, 1½-2½ inches long by 1-1½ broad, petioles about ½ an inch long channelled along the upper side and inconspicuously puberulous, peduncles ½ inch long axillary or from the scars of fallen leaves, generally bearing 2 branched, 3-5 flowered pedicels at the apex and a solitary longish pedicelled flower in the fork, branched pedicels about the length of the peduncles, all minutely pubescent, flowers polygamous pentamerous 3 lines in expansion, petals combined into a rotate corol to fully ½ their length, stamens erect slightly incurved inserted on to the centre of the corol just within the lobes, drupe size of a pea quite red when ripe. *Wight Icones tab.* 1216.

This is a very large tree, often attaining an immense girth, it is very common on the Nilgiris at 6-8000 feet elevation, and in other localities on our western mountains, but generally at considerable elevation, and it is also found in Ceylon; the timber is a pale yellow and very useful for building purposes and plank, bowls, platters, &c., and is much in use on the Nilgiris, where it is called Horralu by the Burghers.

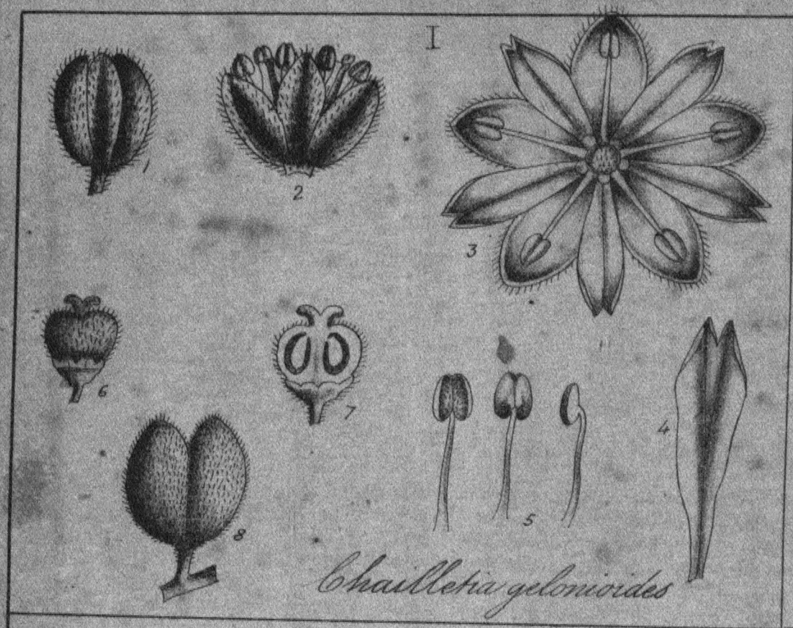
A small fragment of a flowering branch (male) and dissections of a male flower of this tree are figured in Plate cxlii. (with Ilex denticulata.)

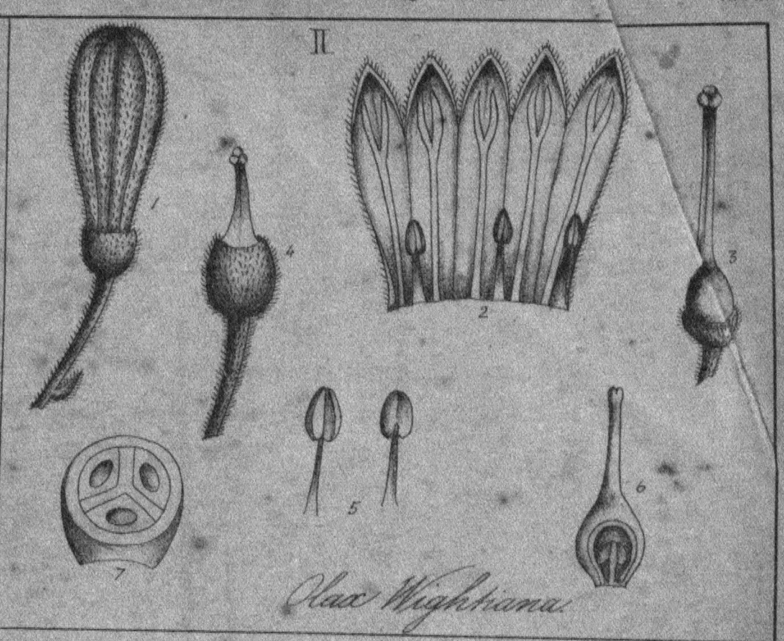
4. ILEX GARDNERIANA, *Wight.*—A small tree or large shrub, glabrous, leaves subcoriaceous or membranaceous ovate lanceolate or sub-cordate quite entire ending in a long acumination, about 4-6 inches long by 1-1½ inches broad, petioles 1 inch long, peduncles axillary or aggregated in the axils of fallen leaves slightly pubescent and together with the 5 merous flowers very similar to those of I. Wightiana, only rather more crowded and the flowers slightly larger; fruit, &c. as in Wightiana. *Wight Icones tab.* 1217.

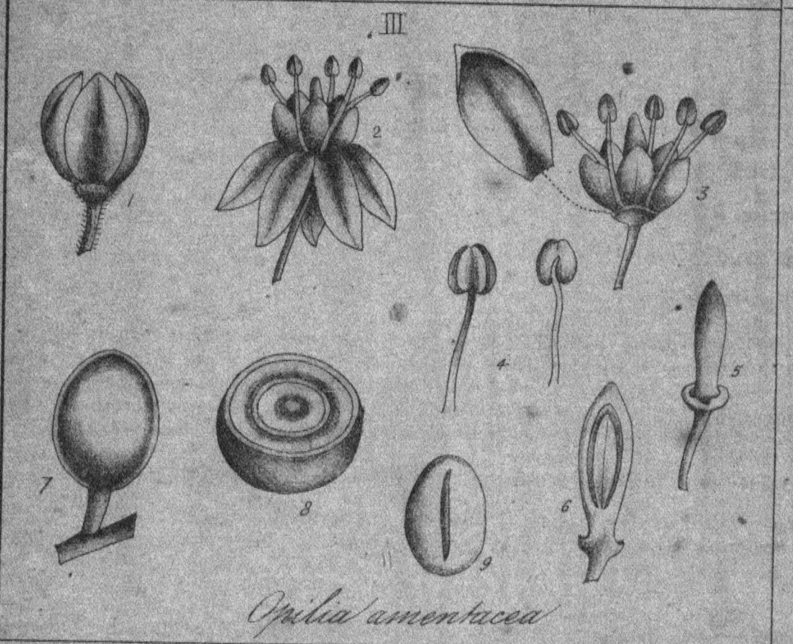
This small tree I have only seen on the Nilgiris (western side), it is closely allied to Wightiana, but is seldom much more than a shrub.

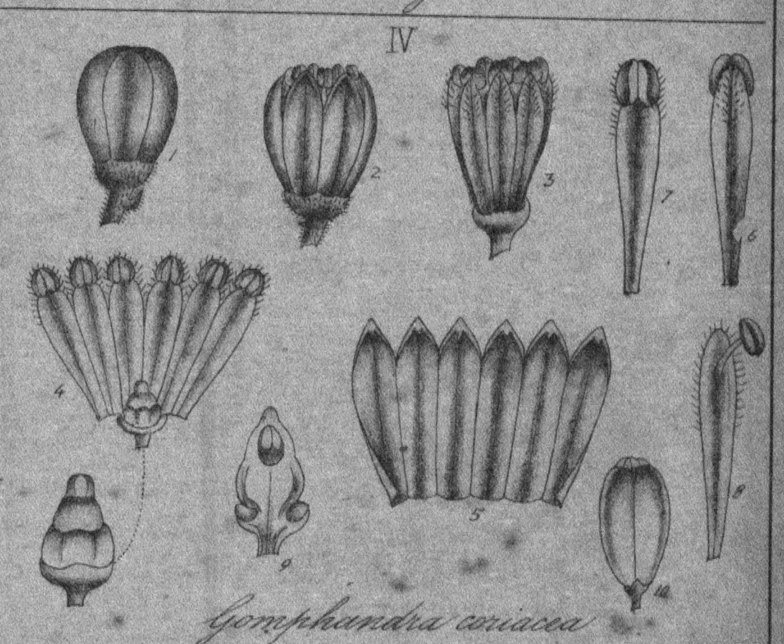
5. ILEX WALKERI, *Wight and Gard. MSS.*—A small tree, leaves coriaceous glabrous shining entire or rarely sparingly denticulate, oblong or rotundate acute or retuse and mucronate, more or less attenuated at the base, 4-12 lines long by 2-7 lines broad, petioles 1½-2 lines long slightly winged, umbels sessile or shortly pedunculate, pedicels about 1½ lines long, flowers pentamerous. *Thw En. Pl. Zeyl. p.* 184.

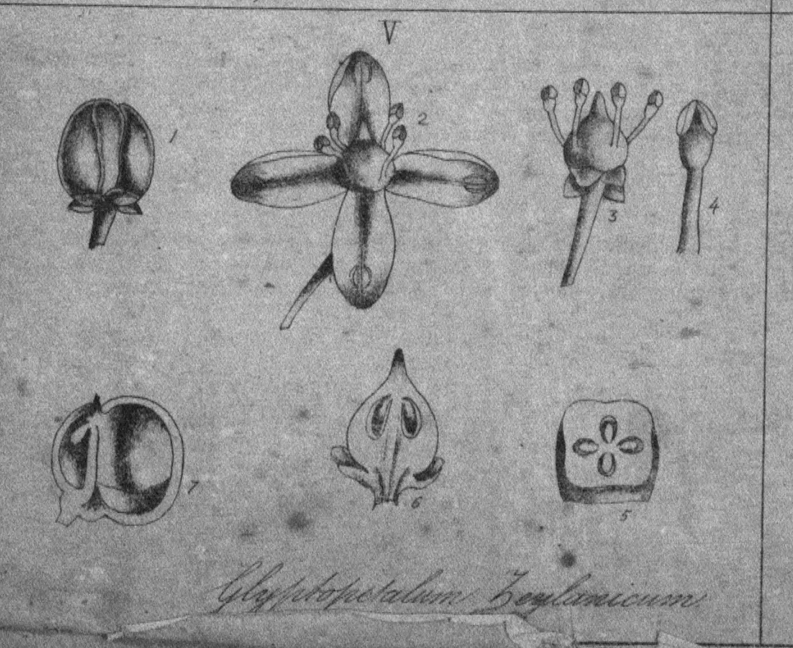
Ceylon, in the central provinces, 5000-8000 feet elevation.

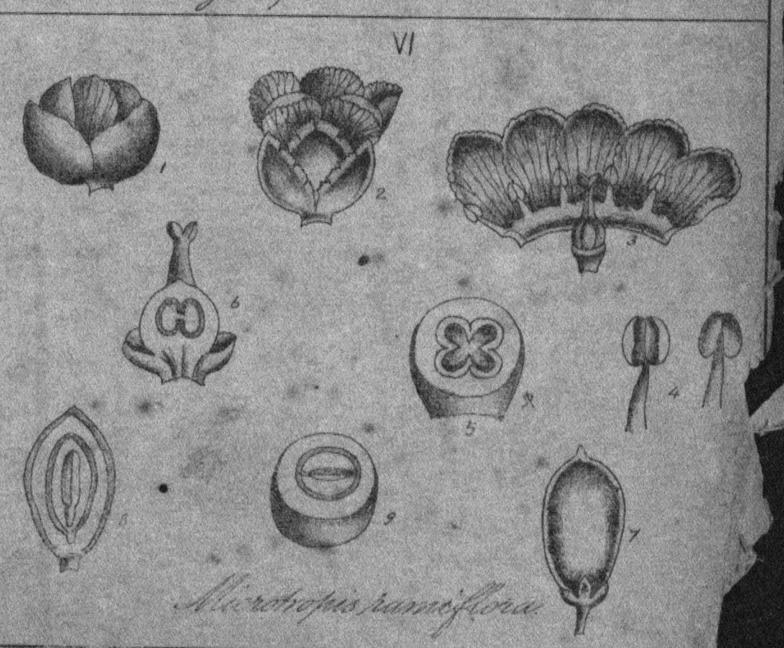

I
Chailletia geloniodes


II
Olax Wightiana


III
Opilia amentacea


IV
Gomphandra coriacea


V
Glyphopetalum Zeylanicum


VI
Microtropis ramiflora